PATENT ABSTRACTS OF JAPAN

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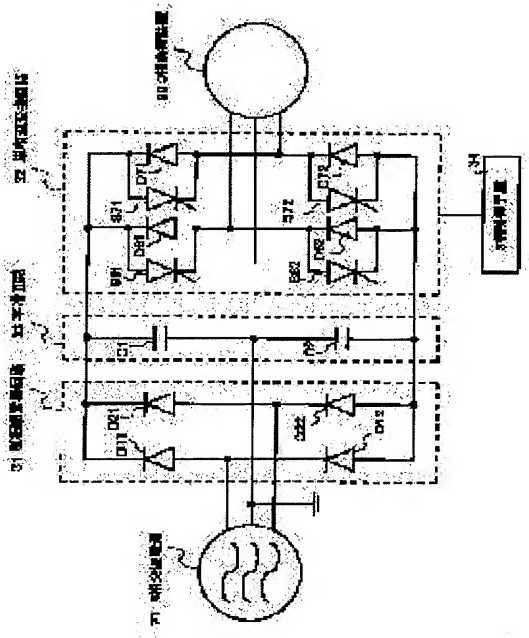
(54) THREE-PHASE INVERTER

(57)Abstract:
PROBLEM TO BE SOLVED: To suppress leakage current and power source noise, and realize miniaturization and reduction in the number of constituent part items and cost.
SOLUTION: One phase of a three-phase AC power source 21, of which the phase in not connected with a single-phase forward converting circuit 31, is connected with an intermediate connection part of capacitors C1 and C2 of a smoothing circuit 33, and with one phase of a three-phase load 26 which phase is not connected with a single-phase backward converting circuit 32. Thereby DC voltages applied to the capacitors C1 and C2 are fixed to about double the potentials of a line voltage of the three-phase AC power source 21, at a maximum, when a ground potential is set as a reference. The DC voltages are applied to a load 26 via the backward converting circuit 32. The potential of one phase of the load 26 is set at a ground potential, and the instantaneous value of a voltage of the other phase is restrained at about double the potential of the line voltage of the power source 21 at a maximum.



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CLAIMS

[Claim(s)]
[Claim 1]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:
A single phase rectification circuit connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply.
A smoothing circuit which are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply at least, and is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus.
A single phase inversion circuit which is connected to said smoothing circuit and connected to the remaining 2 phase input of said three-phase-circuit load apparatus.
A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus.

[Claim 2]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:
A rate rectification circuit of single phase high tensile which consists of a switch element by which antiparallel connection was carried out to a single phase full bridge rectifier and said single phase full bridge rectifier.
A smoothing circuit which are connected to the direct-current side of said rate rectification circuit of single phase high tensile, and the series connection of the capacitor of a couple is carried out, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply at least, and is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus.
A single phase inversion circuit which is connected to said smoothing circuit and connected to the remaining 2 phase input of said three-phase-circuit load apparatus.
A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus, and a rate rectification control means of high tensile which controls said rate rectification circuit of single phase high tensile to form into an outline sine wave current which flows from said three-phase-alternating-current power supply, and to improve a power-factor.

[Claim 3]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:
A single phase rectification circuit connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply.

Are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply, and. A smoothing circuit which may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means for changing opening and closing of a circuit.
A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus.
When making mostly an output of said three-phase-circuit inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said three-phase-circuit inversion circuit into three-phase-circuit voltage up to the twice [about] of power supply voltage, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means.

[Claim 4]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:
A three-phase-circuit rectification circuit connected to a 3-phase output of a three-phase-alternating-current power supply.
It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, A smoothing circuit which one of the intermediate connection parts of these capacitors may be connected via an opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply, and is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus.
A single phase inversion circuit which is connected to said smoothing circuit and connected to the remaining 2 phase input of said three-phase-circuit load apparatus.
When making an output of said single phase inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage mostly, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said single phase inversion circuit into three-phase-circuit voltage up to 1/about 2 time of power supply voltage, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means.

[Claim 5]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:
A three-phase-circuit rectification circuit connected to a 3-phase output of a three-phase-alternating-current power supply.
It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, One of the intermediate connection parts of these capacitors may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means for changing opening and closing of a circuit, and. A smoothing circuit which may be connected via the 2nd opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply.
A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus.
A keying-circuit control means which controls each switching condition of said 1st opening and

closing means and said 2nd opening and closing means corresponding to an output voltage range of said three-phase-circuit inversion circuit, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said 1st opening and closing means and said 2nd opening and closing means.

[Claim 6]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:
A three-phase-circuit rectification circuit connected to a 3-phase output of a three-phase-alternating-current power supply.
A smoothing circuit where it is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected at a neutral point of said three-phase-alternating-current power supply, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus.

[Claim 7]The three-phase-circuit inverter device according to claim 6, wherein said intermediate connection part of the capacitors of said smoothing circuit is connected also at a neutral point of said three-phase-circuit load apparatus.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the three-phase-circuit inverter device which changes and outputs the voltage and frequency of a three-phase-alternating-current power supply.
[0002]
[Description of the Prior Art]Drawing 11 is a block diagram showing the composition of a common three-phase-circuit inverter device. The three-phase-circuit rectification circuit 11 of composition of that the diode row to which this inverter device carried out the series connection of the diode of a couple was connected to 3 parallel, It has the composition that the three-phase-circuit inversion circuit 12 of composition of that the diode row which carried out the series connection of the diode of a couple was connected to 3 parallel, and antiparallel connection of the switch element was carried out to each one diode of every, and the smoothing capacitor 13 were connected in parallel. Antiparallel connection means that two elements carry out polarity reversely and are connected in parallel.
[0003]In three diode rows of the three-phase-circuit rectification circuit 11, the three phase circuit of the three-phase-alternating-current power supply 21 is supplied to the intermediate connection part of the diode of the couple of each sequence the plane 1 every.
[0004]The output of the three phase circuit of the three-phase-circuit inversion circuit 12 is supplied to each phase of the three-phase-circuit load apparatus 26 the plane 1 every from the intermediate connection part of the diode of the couple of each sequence in three diode rows of the three-phase-circuit inversion circuit 12.
[0005]When the plane 1 of the three-phase-alternating-current power supply 21 is grounded, it is known for the three-phase-circuit inverter device of composition of being shown in drawing 11 that unspecified potential will be impressed to the three-phase-circuit load apparatus 26 to earth potentials. Since it changes with the switch elements in the three-phase-circuit inversion circuit 12 at high speed and the leakage current becomes large with the stray capacitance between the three-phase-circuit load apparatus 26 and earth potentials, the unspecified potential impressed causes [of a power supply noise or leak current] an increase. Therefore, it is preferred to inhibit the influence of the unspecified potential as much as possible. The miniaturization of an inverter device, reduction of component-parts mark, and low cost-ization are also required.
[0006]By the way, in the single phase inverter circuit, the circuit coped with for reducing leak current and a power supply noise is proposed (the Fuji time signal, Vol.71, No.7, p.407-410, 1998). The rate converter circuit 14 of single phase high tensile of composition of this single phase inverter circuit having carried out the series connection of the diode of a couple, as shown in drawing 12, and having carried out antiparallel connection of the switch element to each one diode of every, It has the composition that the single phase inversion circuit 15 of composition of having carried out the series connection of the diode of a couple, and having carried out antiparallel connection of the switch element to each one diode of every and the smoothing circuit 16 which carried out the series connection of the capacitor of a couple were connected

in parallel.
[0007]And one output phases of the two phases of the single-phase alternative current power supply 22, While the intermediate connection part of the diode of the couple of the rate converter circuit 14 of single phase high tensile is supplied via AC reactor 17, the output phases of another side of the single-phase alternative current power supply 22 are supplied to one output phases of the intermediate connection part of the capacitor of the couple of the smoothing circuit 16, and the single phase inversion circuit outputting part 27. The output from the intermediate connection part of the diode of the couple of the single phase inversion circuit 15 is supplied to another output phases of the single phase inversion circuit outputting part 27.
[0008]According to the single phase inverter circuit shown in this drawing 12, both leak current and a power supply noise are controlled, and it is supposed that the effect that reduction of a miniaturization and component-parts mark and low cost-ization are further realizable will be acquired.
[0009]
[Problem(s) to be Solved by the Invention]However, it is still difficult to realize control of leak current, and control of a power supply noise like the single phase inverter circuit mentioned above in a three-phase-circuit inverter device, and it also difficult to fill the demand of the miniaturization of an inverter device, reduction of component-parts mark, low-cost-izing, etc.
[0010]This invention was made in view of the above-mentioned situation, and controls leak current and a power supply noise in a three-phase-circuit inverter device, and an object of this invention is to obtain the three-phase-circuit inverter device which can realize reduction of a miniaturization and component-parts mark, and low cost-ization further.
[0011]
[Means for Solving the Problem]In order to attain the above-mentioned purpose, on the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a single phase rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, Are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply, and. A single phase inversion circuit which is connected to a smoothing circuit connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and said smoothing circuit, and is connected to the remaining 2 phase input of said three-phase-circuit load apparatus, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus is provided.
[0012]According to this invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, and a single phase inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus.
[0013]This invention is an inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, A rate rectification circuit of single phase high tensile which consists of a switch element by which antiparallel connection was carried out to a single phase full bridge rectifier and said single phase full bridge rectifier, Are connected to the direct-current side of said rate rectification circuit of single phase high tensile, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-

current power supply, and. A single phase inversion circuit which is connected to a smoothing circuit connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and said smoothing circuit, and is connected to the remaining 2 phase input of said three-phase-circuit load apparatus, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus, and a rate rectification control means of high tensile which controls said rate rectification circuit of single phase high tensile to form into an outline sine wave current which flows from said three-phase-alternating-current power supply, and to improve a power-factor are provided.

[0014]According to this invention, a rate rectification circuit of single phase high tensile consists of a switch element by which antiparallel connection was carried out to a single phase full bridge rectifier and said single phase full bridge rectifier, One of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, is connected to the remaining 2 phase input of a three-phase-circuit load apparatus by single phase inversion circuit, and by a three-phase-circuit control means. A single phase inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus, and a rate rectification circuit of single phase high tensile is controlled so that current which flows from a three-phase-alternating-current power supply is formed into an outline sine wave by rate rectification control means of high tensile and a power-factor is further improved by it.

[0015]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a single phase rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, Are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply, and. A smoothing circuit which may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means for changing opening and closing of a circuit, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus, When making mostly an output of said three-phase-circuit inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said three-phase-circuit inversion circuit into three-phase-circuit voltage up to the twice [about] of power supply voltage, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means is provided.

[0016]According to this invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means, It is connected to a three-phase-circuit input of a three-phase-circuit load apparatus, and a three-phase-circuit inversion circuit by a keying-circuit control means an opening and closing means, When making an output of a three-phase-circuit inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage mostly, it will be in a closed circuit state, It is controlled to be in an open state, when making an output of a three-phase-circuit inversion circuit into three-phase-circuit voltage up to the twice [about] of power supply voltage, and further, a three-phase-circuit inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a

three-phase-circuit load apparatus corresponding to a switching condition of an opening and closing means.

[0017]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a three-phase-circuit rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to a 3-phase output of a three-phase-alternating-current power supply, It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, One of the intermediate connection parts of these capacitors may be connected via an opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply, and. A single phase inversion circuit which is connected to a smoothing circuit connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and said smoothing circuit, and is connected to the remaining 2 phase input of said three-phase-circuit load apparatus, When making an output of said single phase inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage mostly, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said single phase inversion circuit into three-phase-circuit voltage up to 1/about 2 time of power supply voltage, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means is provided.

[0018]According to this invention, a three-phase-circuit rectification circuit is connected to a 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to a plane 1 output of a three-phase-alternating-current power supply via an opening and closing means, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, When an opening and closing means makes an output of a single phase inversion circuit power supply voltage with three-phase-circuit voltage to the voltage mostly by a keying-circuit control means, it will be in a closed circuit state, It is controlled to be in an open state, when making an output of a single phase inversion circuit into three-phase-circuit voltage up to 1/about 2 time of power supply voltage, and further, a single phase inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to a switching condition of an opening and closing means.

[0019]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a three-phase-circuit rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to a 3-phase output of a three-phase-alternating-current power supply, It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, One of the intermediate connection parts of these capacitors may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means for changing opening and closing of a circuit, and. A smoothing circuit which may be connected via the 2nd opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus, A keying-circuit control means which controls each switching condition of said 1st opening and closing means and said 2nd opening and closing means corresponding to an output voltage range of said three-phase-circuit inversion circuit, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said 1st opening and closing means and said 2nd opening and closing means is provided.

[0020]According to this invention, a three-phase-circuit rectification circuit is connected to a 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means, and. It is connected to a plane 1 output of a three-phase-alternating-current power supply via the 2nd opening and closing means, is connected to a three-phase-circuit input of a three-phase-circuit load apparatus by three-phase-circuit inversion circuit, and by a keying-circuit control means. Corresponding to an output voltage range of a three-phase-circuit inversion circuit, each switching condition of the 1st opening and closing means and the 2nd opening and closing means is controlled, and further by a three-phase-circuit control means. A three-phase-circuit inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to a switching condition of the 1st opening and closing means and the 2nd opening and closing means.
[0021]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a three-phase-circuit rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to a 3-phase output of a three-phase-alternating-current power supply, A smoothing circuit where it is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected at a neutral point of said three-phase-alternating-current power supply, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus is provided.
[0022]According to this invention, a three-phase-circuit rectification circuit is connected to a 3-phase output of a three-phase-alternating-current power supply, one of the intermediate connection parts of the capacitors of a smoothing circuit is connected at a neutral point of a three-phase-alternating-current power supply, and a three-phase-circuit inversion circuit is connected to a three-phase-circuit input of a three-phase-circuit load apparatus.
[0023]In this invention, said intermediate connection part of the capacitors of said smoothing circuit may be connected also at a neutral point of said three-phase-circuit load apparatus.
[0024]According to this invention, an intermediate connection part of the capacitors of a smoothing circuit is connected also at a neutral point of a three-phase-circuit load apparatus.
[0025]
[Embodiment of the Invention]Hereafter, with reference to an accompanying drawing, the embodiment of the three-phase-circuit inverter device concerning this invention is described in detail.
[0026]Embodiment 1. drawing 1 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 1. The single phase rectification circuit 31 of composition of that the diode row which, as for this inverter device, carried out the series connection of the diode D11 of a couple, the diode D21 of the diode row which carried out the series connection of D12, and a couple, and D22 was connected in parallel, The diode D61 of a couple, the diode row which carried out the series connection of D62, and the diode D71 of a couple and the diode row which carried out the series connection of D72 are connected in parallel, And it has the composition that the single phase inversion circuit 32 of composition of that antiparallel connection of the switch element S61, S62, S71, and S72 was carried out to each diode D61, D62, D71, and one Devery72, and the capacitor C1 of a couple and the smoothing circuit 33 which carried out the series connection of C2 were connected in parallel.
[0027]In two diode rows of the single phase rectification circuit 31, two phases of the three phase circuits of the three-phase-alternating-current power supply 21 are supplied to the intermediate connection part of the diode D11 and the diode D12, and the intermediate connection part of the diode D21 and the diode D22 the plane 1 every. The remaining plane 1 of the three-phase-alternating-current power supply 21 is grounded, and is supplied to the plane 1 of the inputs of the intermediate connection part of the capacitor C1 of the smoothing circuit

33, and the capacitor C2, and the three phase circuit of the three-phase-circuit load apparatus 26. The output from the intermediate connection part of the diode D61 of the single phase inversion circuit 32 and the diode D62 and the output from the intermediate connection part of the diode D71 and the diode D72 are supplied to the two remaining phases of an input of the three-phase-circuit load apparatus 26, respectively.

[0028]The single phase inversion circuit 32 is controlled by the three-phase-circuit control means 34. The three-phase-circuit control means 34 is a means for controlling to supply 3-phase alternating-current voltage to the three-phase-circuit load apparatus 26.

[0029]An operation of Embodiment 1 is explained below. The plane 1 which is not connected to the single phase rectification circuit 31 of the three-phase-alternating-current power supply 21 is connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2, The about [abbreviation root2 time] potential of the line voltage of the three-phase-alternating-current power supply 21 is impressed between both the capacitors C1 of the smoothing circuit 33, and each two poles of C2. The output of the plane 1 of the single phase inversion circuit 32 is controlled by the three-phase-circuit control means 34 to the output from the intermediate connection part of the smoothing circuit 33, and voltage VRS which has a desired pressure value and frequency between line of the three-phase-circuit load apparatus 26 by it is impressed.

[0030]The output of the remaining plane 1 of the single phase inversion circuit 32 is controlled by the three-phase-circuit control means 34 to the output from the intermediate connection part of the smoothing circuit 33, and the voltage VST from which 120 degrees of phases differ to voltage VRS among other lines of the three-phase-circuit load apparatus 26 by it is impressed. With voltage VRS and the voltage VST, since the remaining voltage VTRs become settled automatically, a three-phase-alternating-current output can be obtained as the composition of the single phase inversion circuit 32 is also.

[0031]According to the Embodiment 1, an unconnected plane 1 in the single phase rectification circuit 31 of the three-phase-alternating-current power supply 21, Since it is connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 and is connected to the plane 1 which is not connected to the single phase inversion circuit 32 of the three-phase-circuit load apparatus 26, The capacitor C1 and the direct current voltage impressed to C2, respectively, Since it is fixed to the about [abbreviation root2 time] potential of the line voltage of the three-phase-alternating-current power supply 21 at the maximum on the basis of earth potentials and the direct current voltage is impressed to the three-phase-circuit load apparatus 26 through the three-phase-circuit inversion circuit 32, Potential of the plane 1 of the three-phase-circuit load apparatus 26 can be made into earth potentials, and the instantaneous value of the voltage of other phases can be controlled at the maximum to the about [abbreviation root2 time] potential of the line voltage of the three-phase-alternating-current power supply 21. As a result, leak current and a power supply noise can be controlled.

[0032]According to the Embodiment 1, like the single phase rectification circuit where the composition of the rectification circuit 31 is common, since the composition of the inversion circuit 32 is the same as that of a general single phase inversion circuit, the miniaturization of an inverter device, reduction of component-parts mark, and low cost-ization are attained. Furthermore, a loss can also be reduced with reduction of component-parts mark.

[0033]An AC reactor and a direct current reactor may be arbitrarily combined with the inverter device of the above-mentioned composition, the power-factor of a power supply can be improved, and the harmonic content of current can be controlled.

[0034]Embodiment 2. drawing 2 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 2. That this inverter device differs from the above-mentioned Embodiment 1, It is having formed the rate rectification circuit 41 of single phase high tensile instead of the single phase rectification circuit 31, having connected AC reactors 42 and 43 to the three-phase-alternating-current power supply 21 side of the rate rectification circuit 41 of single phase high tensile, respectively, and having established the rate rectification control means 44 of high tensile which controls the rate rectification circuit 41 of single phase high tensile. Since other composition is the same as that

of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.
[0035]The rectifier sequence to which, as for the rate rectification circuit 41 of single phase high tensile, the series connection of the single phase full bridge rectifier D111 of a couple, the single phase full bridge rectifier D121 of the rectifier sequence which carried out the series connection of D112, and a couple, and D122 was carried out is connected in parallel, And it has the composition that antiparallel connection of the switch element S111, S112, S121, and S122 was carried out to each single phase full bridge rectifier D111, D112, D121, and one Devery122.
[0036]The rate rectification control means 44 of high tensile forms into an outline sine wave the current which flows from the three-phase-alternating-current power supply 21, and controls the rate rectification circuit 41 of single phase high tensile to make power factor improvement possible.
[0037]An operation of Embodiment 2 is explained below. Voltage VRS_conv which has a desired pressure value and frequency occurs between the plane 1 output inside the rate rectification circuit 41 of single phase high tensile, and the phase connected to the intermediate junction of the capacitor C1 of the smoothing circuit 33 of the three-phase-alternating-current power supply 21, and the capacitor C2. This voltage VRS_conv is impressed between AC reactors to power supply phase voltage VRS, and the power supply current which flows by it is decided. Therefore, the rate rectification circuit 41 of single phase high tensile is controlled by the rate rectification control means 44 of high tensile, power supply current is formed into an outline sine wave, and voltage VRS_conv which can improve a power-factor is generated.
[0038]Also about between other plane 1 outputs inside the rate rectification circuit 41 of single phase high tensile, and the phases connected to the intermediate junction of the capacitor C1 and the capacitor C2 of the three-phase-alternating-current power supply 21. The rate rectification control means 44 of high tensile performs same control, power supply current is formed into an outline sine wave, and voltage VST_conv which can improve a power-factor is generated.
[0039]Since it is the same as that of Embodiment 1 about control of the inversion circuit 32, explanation is omitted.
[0040]The same effect as Embodiment 1, i.e., control of leak current, according to the Embodiment 2, Control of a power supply noise, the miniaturization of an inverter device, reduction of component-parts mark, the effect that low-cost-izing and reduction of a loss are possible is acquired -- in addition, the rate rectification circuit 41 of single phase high tensile was used as a rectification circuit of the three-phase-alternating-current power supply 21 -- a sake -- from the three-phase-alternating-current power supply 21 -- flowing -- current -- an outline -- a sine wave ---izing -- a power-factor -- being improvable -- saying -- an effect -- obtaining -- having .
[0041]Embodiment 3. drawing 3 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 3. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit inversion circuit 52 instead of the single phase inversion circuit 32, and the output of the three phase circuit of the three-phase-circuit inversion circuit 52 a plane 1 every to each phase of the three-phase-circuit load apparatus 26 It was made to supply. The intermediate connection part of the capacitor C1 of the smoothing circuit 33 and the capacitor C2 was connected via the opening and closing means 54 of a switch etc. at the output point of the plane 1 portion of the three-phase-circuit inversion circuit 52, It is having established the keying-circuit control means 55 which controls opening and closing of the opening and closing means 54, and having established the three-phase-circuit control means 56 for controlling the three-phase-circuit inversion circuit 52. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.
[0042]The diode row which, as for the three-phase-circuit inversion circuit 52, carried out the series connection of the diode D281 of a couple and D282 to the diode D261 of a couple, the diode row which carried out the series connection of D262, and the diode D271 of a couple and

the diode row which carried out the series connection of D272 is connected in parallel, And it has the composition that antiparallel connection of the switch element S261, S262, S271, S272, S281, and S282 was carried out to each diode D261, D262, D271, D272, D281, and one Devery282. The output of the three phase circuit of the three-phase-circuit inversion circuit 52 is supplied to each phase of the three-phase-circuit load apparatus 26 the plane 1 every from the intermediate connection part of the diode of the couple of each diode row.

[0043]To the opening and closing means 54, the keying-circuit control means 55 is changed into a closed circuit state, when making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the three-phase-circuit inversion circuit 52, and it is controlled to consider it as an open state, in carrying out output possible voltage of said three-phase-circuit inversion circuit 10 to to the twice [about] of power supply voltage.

[0044]The three-phase-circuit control means 56 is controlled to the three-phase-circuit inversion circuit 52 to supply 3-phase alternating-current voltage to the three-phase-circuit load apparatus 26 according to the switching condition of the opening and closing means 54.

[0045]Drawing 4 is a flow chart for explaining operation of the inverter device of Embodiment 3. It is judged first whether the range of the output voltage Vout of the three-phase-circuit inversion circuit 52 is larger than the line voltage Vin of the three-phase-alternating-current power supply 21 (Step S1). And when you need the output voltage more than the line voltage Vin of the three-phase-alternating-current power supply 21 when Vout is more than Vin namely, The opening and closing means 54 is made into an opened state, and connection between the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S2).

[0046]The three-phase-circuit arm of the three-phase-circuit inversion circuit 52 is controlled by the state by the three-phase-circuit control means 56, respectively, and switching control of the phase voltage of each output phases of the three-phase-circuit inversion circuit 52 is carried out with the line voltage about 2root2 twice the voltage of a three phase circuit which is the potential by the side of the high tension to the low-voltage side of the smoothing circuit 33 (Step S3). By it, 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0047]On the other hand, when you need output voltage smaller than the line voltage Vin of the three-phase-alternating-current power supply 21 at Step S1 when Vout is smaller than Vin namely, The opening and closing means 54 is made into a closed state, and the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 are connected (step S4). And the three-phase-circuit control means 56 is controlled about two phases which are not connected to the capacitor C1 of the smoothing circuit 33 in the three-phase-circuit inversion circuit 52, and the intermediate connection part of C2 to be able to realize the same control as the above-mentioned Embodiment 1 (Step S5), and a series of control is ended.

[0048]The switching condition of the opening and closing means 54 that according to the Embodiment 3 the opening and closing means 54 for changing the output voltage from the three-phase-circuit inversion circuit 52 is established, and it was made to carry out switching control A sake, The output from the three-phase-circuit inversion circuit 52 can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with power supply voltage. And in making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the three-phase-circuit inversion circuit 52, the effect that control of the same effect as the above-mentioned Embodiment 1, i.e., leak current, control of a power supply noise, the miniaturization of an inverter device, reduction of component-parts mark, low-cost-izing, and reduction of a loss are possible is acquired.

[0049]Embodiment 4. drawing 5 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 4. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit rectification circuit 61 instead of the single phase rectification circuit 31, and the 3-phase output of the three-phase-alternating-current power supply 21 a plane 1 every to the three phase circuit of

the three-phase-circuit rectification circuit 61 It was made to supply. It is having connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 the plane 1 by which it was grounded of the three phase circuits of the three-phase-alternating-current power supply 21 via the opening and closing means 64 of a switch etc., and having established the keying-circuit control means 65 which controls opening and closing of the opening and closing means 64. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.

[0050]The three-phase-circuit rectification circuit 61 has the composition that the diode D311 of a couple, the diode row which carried out the series connection of D312, the diode D321 of a couple and the diode row which carried out the series connection of D322, and the diode D331 of a couple and the diode row which carried out the series connection of D332 were connected in parallel. The output of the three-phase-alternating-current power supply 21 is supplied to the intermediate connection part of the diode of the couple of each diode row a plane 1 every.

[0051]To the opening and closing means 64, the keying-circuit control means 65 is made into an open state, when outputting the three-phase-circuit voltage to 1(1/2)/about 2 of power supply voltage to the three-phase-circuit load apparatus 26, and it is controlled to change into a closed circuit state, in carrying out mostly output possible voltage to the three-phase-circuit load apparatus 26 to to the voltage with power supply voltage.

[0052]Drawing 6 is a flow chart for explaining operation of the inverter device of Embodiment 4. It is judged first whether the range of the output voltage Vout of the single phase inversion circuit 32 is larger than the line voltage Vin of the three-phase-alternating-current power supply 21 (Step S11). And when Vout needs the output voltage to the voltage mostly with the line voltage Vin of the time 21 to the almost same voltage as Vin, i.e., a three-phase-alternating-current power supply, The opening and closing means 64 is made into a closed state, and the plane 1 arm in the three-phase-circuit rectification circuit 61, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 are connected (Step S12). The three-phase-circuit control means 34 performs the same control as the above-mentioned Embodiment 1 to the single phase inversion circuit 32 in the state (Step S14), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0053]When Vout is at Step S11 on the other hand to one 1(1/2)/about 2 twice the voltage of Vin, Namely, when you need the output voltage up to 1(1/2)/about 2 time of the line voltage Vin of the three-phase-alternating-current power supply 21, The opening and closing means 64 is made into an opened state, connection between the plane 1 arm in the three-phase-circuit rectification circuit 61, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S13), it progresses to Step S14, 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0054]The switching condition of the opening and closing means 64 that according to the Embodiment 4 the opening and closing means 64 for changing the output voltage from the single phase inversion circuit 32 is established, and it was made to carry out switching control A sake, The output from the single phase inversion circuit 32 can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to 1(1/2)/about 2 time of power supply voltage with power supply voltage. And in making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the single phase inversion circuit 32, the effect that control of the same effect as the above-mentioned Embodiment 1, i.e., leak current, control of a power supply noise, the miniaturization of an inverter device, reduction of component-parts mark, low-cost-izing, and reduction of a loss are possible is acquired.

[0055]In making the three-phase-circuit voltage from the single phase inversion circuit 32 to 1 (1/2)/about 2 time of power supply voltage output, since the voltage change by switching will be 1(1/2)/about 2 time, a bigger effect is acquired to leak current and power supply noise control -- in addition, the rate of a carrier frequency component over output voltage is controlled, and the ripple component of current and the quasistable state of load can be controlled.

[0056]Embodiment 5. drawing 7 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 5. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit rectification circuit 61 instead of the single phase rectification circuit 31, and the 3-phase output of the three-phase-alternating-current power supply 21 a plane 1 every to the three phase circuit of the three-phase-circuit rectification circuit 61 It was made to supply. Form the three-phase-circuit inversion circuit 52 instead of the single phase inversion circuit 32, and the output of the three phase circuit of the three-phase-circuit inversion circuit 52 a plane 1 every to each phase of the three-phase-circuit load apparatus 26 It was made to supply. The intermediate connection part of the capacitor C1 of the smoothing circuit 33 and the capacitor C2 was connected via the 1st opening and closing means 54 of a switch etc. at the output point of the plane 1 portion of the three-phase-circuit inversion circuit 52, The plane 1 by which it was grounded of the three phase circuits of the three-phase-alternating-current power supply 21 was connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 via the 2nd opening and closing means 64 of a switch etc., It is having established the 1st keying-circuit control means 55 and the 2nd keying-circuit control means 65 which control opening and closing of the 1st opening and closing means 54 and the 2nd opening and closing means 64, respectively, and having established the three-phase-circuit control means 56 for controlling the three-phase-circuit inversion circuit 52. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.
[0057]The three-phase-circuit inversion circuit 52, the 1st opening and closing means 54, the 1st keying-circuit control means 55, and the three-phase-circuit control means 56 are the things of the same composition as the three-phase-circuit inversion circuit 52 of Embodiment 3 shown in drawing 3, respectively, the opening and closing means 54, the keying-circuit control means 55, and the three-phase-circuit control means 56. Therefore, since it overlaps, these circuits and explanation of each means are omitted.
[0058]The three-phase-circuit rectification circuit 61, the 2nd opening and closing means 64, and the 2nd keying-circuit control means 65 are the things of the same composition as the three-phase-circuit rectification circuit 61 of Embodiment 4 shown in drawing 5, respectively, the opening and closing means 64, and the keying-circuit control means 65. Therefore, since it overlaps, these circuits and explanation of each means are omitted.
[0059]Drawing 8 is a flow chart for explaining operation of the inverter device of Embodiment 5. It is judged first whether the range of the output voltage Vout of the three-phase-circuit inversion circuit 52 is larger than the line voltage Vin of the three-phase-alternating-current power supply 21 (Step S21). And when you need the output voltage up to the twice [about] of the line voltage Vin of the three-phase-alternating-current power supply 21 when Vout is more than Vin namely, The 2nd opening and closing means 64 is changed into a closed circuit state by the 2nd keying-circuit control means 65, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 are connected to the three-phase-alternating-current power supply 21 (Step S22).
[0060]And the 1st opening and closing means 54 is made into an open state by the 1st keying-circuit control means 55, and connection between the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S23). The three-phase-circuit arm of the three-phase-circuit inversion circuit 52 is controlled by the state by the three-phase-circuit control means 56, respectively, Switching control of the phase voltage of each output phases of the three-phase-circuit inversion circuit 52 is carried out with the line voltage about 2root2 twice the voltage of a three phase circuit which is the potential by the side of the high tension to the low-voltage side of the smoothing circuit 33 (Step S24), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.
[0061]On the other hand, when you need output voltage smaller than the line voltage Vin of the three-phase-alternating-current power supply 21 at Step S21 when Vout is smaller than Vin namely, it judges whether Vout is 1(1/2)/about 2 twice the Vin (Step S25). When Vout is 1

(1/2)/about 2 twice the Vin, it is judged whether the three-phase-circuit balance of the current of the three-phase-alternating-current power supply 21 is thought further as important (Step S26).

[0062]In thinking a three-phase-circuit balance as important at Step S26, the 2nd opening and closing means 64 is made into an open state by the 2nd keying-circuit control means 65, and it intercepts connection with the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 and the three-phase-alternating-current power supply 21 (Step S27). And the 1st opening and closing means 54 is made into an open state by the 1st keying-circuit control means 55, and connection between the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S28).

[0063]The three-phase-circuit arm of the three-phase-circuit inversion circuit 52 is controlled by the state by the three-phase-circuit control means 56, respectively, Switching control of the phase voltage of each output phases of the three-phase-circuit inversion circuit 52 is carried out with the line voltage twice [abbreviation root2] the voltage of a three phase circuit which is the potential by the side of the high tension to the low-voltage side of the smoothing circuit 33 (Step S29), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0064]In thinking as important control of leak current and a power supply noise, without thinking a three-phase-circuit balance as important at Step S26, the 2nd opening and closing means 64 is changed into a closed circuit state by the 2nd keying-circuit control means 65, and it connects the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 to the three-phase-alternating-current power supply 21 (Step S30). And the 1st opening and closing means 54 is changed into a closed circuit state by the 1st keying-circuit control means 55, and the plane 1 arm in the three-phase-circuit inversion circuit 52 is connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 (Step S31). By the three-phase-circuit control means 56, about two phases which are not connected to the capacitor C1 of the smoothing circuit 33 in the three-phase-circuit inversion circuit 52, and the intermediate connection part of C2 in the state, The same control as the above-mentioned Embodiment 1 is performed (Step S32), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0065]When Vout is not 1(1/2)/about 2 twice the Vin at Step S25, the 2nd opening and closing means 64 is made into an open state by the 2nd keying-circuit control means 65, and connection with the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 and the three-phase-alternating-current power supply 21 is intercepted (Step S33). And the 1st opening and closing means 54 is changed into a closed circuit state by the 1st keying-circuit control means 55, and the plane 1 arm in the three-phase-circuit inversion circuit 52 is connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 (Step S34). By the three-phase-circuit control means 56, about two phases which are not connected to the capacitor C1 of the smoothing circuit 33 in the three-phase-circuit inversion circuit 52, and the intermediate connection part of C2 in the state, The same control as the above-mentioned Embodiment 1 is performed (Step S35), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0066]According to the Embodiment 5, the 1st opening and closing means 54 and 2nd opening and closing means 64 for changing the output voltage from the three-phase-circuit inversion circuit 52 are established, The switching condition of these 1st and 2nd opening and closing means 54 and 64 that it was made to carry out switching control A sake, The output from the three-phase-circuit inversion circuit 52 can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with the three-phase-circuit voltage up to 1(1/2)/about 2 time of power supply voltage, and power supply voltage. And in making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the three-phase-circuit inversion circuit 52, the effect that control of the same effect as the above-mentioned Embodiment 1, i.e., leak current, control of a power supply noise, the miniaturization of an inverter device, reduction of

component-parts mark, low-cost-izing, and reduction of a loss are possible is acquired.
[0067]In making the three-phase-circuit voltage from the three-phase-circuit inversion circuit 52 to 1(1/2)/about 2 time of power supply voltage output, since the voltage change by switching will be 1(1/2)/about 2 time, a bigger effect is acquired to leak current and power supply noise control -- in addition, the rate of a carrier frequency component over output voltage is controlled, and the ripple component of current and the quasistable state of load can be controlled.
[0068]Embodiment 6. drawing 9 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 6. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit rectification circuit 61 instead of having replaced with the three-phase-alternating-current power supply 21, and having used the three-phase-circuit Y connection power supply 23, and the single phase rectification circuit 31, and the 3-phase output of a three-phase-circuit Y connection power supply a plane 1 every to the three phase circuit of the three-phase-circuit rectification circuit 61 It was made to supply. The three-phase-circuit inversion circuit 52 is formed instead of the single phase inversion circuit 32, and it is having made it supply and having connected the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 at the neutral point of the three-phase-circuit Y connection power supply a plane 1 every at each phase of the three-phase-circuit load apparatus 26 about the output of the three phase circuit of the three-phase-circuit inversion circuit 52. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.
[0069]The three-phase-circuit inversion circuit 52 and the three-phase-circuit rectification circuit 61 are the things of the same composition as the three-phase-circuit inversion circuit 52 of Embodiment 3 shown in drawing 3, respectively, and the three-phase-circuit rectification circuit 61 of Embodiment 4 shown in drawing 5. Therefore, since it overlaps, explanation of those circuits is omitted.
[0070]An operation of Embodiment 6 is explained below. The voltage between a node with the three-phase-circuit Y connection power supply 23 of the smoothing circuit 33 and the higher rank potential side of the smoothing circuit 33 becomes twice [abbreviation root2] a phase voltage effective value of the three-phase-circuit Y connection power supply 23. The voltage between a node with the three-phase-circuit Y connection power supply 23 of the smoothing circuit 33 and the low rank potential side of the smoothing circuit 33 becomes twice [abbreviation root2] a phase voltage effective value of the three-phase-circuit Y connection power supply 23 similarly. Therefore, the direct current voltage impressed to the three-phase-circuit inversion circuit 52 will become by about 2root2 twice the phase voltage effective value of the three-phase-circuit Y connection power supply 23, and the output voltage effective value between sinusoidal wave output lines of the three-phase-circuit inversion circuit 52 will be the abbreviation root3 time of the phase voltage effective value of the three-phase-circuit Y connection power supply 23.
[0071]In not connecting the neutral point of the three-phase-circuit Y connection power supply 23 to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 to it, The direct current voltage impressed to the three-phase-circuit inversion circuit 52 will be the abbreviation root6 time of the phase voltage effective value of the three-phase-circuit Y connection power supply 23, and the output voltage effective value between sinusoidal wave output lines of the three-phase-circuit inversion circuit 52 is up to about 3(3/2)/2 time of a phase voltage effective value. Therefore, output voltage increases about 15% by having connected the neutral point of the three-phase-circuit Y connection power supply 23 to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2.
[0072]Since the neutral point of the three-phase-circuit Y connection power supply 23 was connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 according to the Embodiment 6, Since the instant voltage to the earth potentials which can increase and are further impressed to the three-phase-circuit load apparatus 26 can also control the output of the three-phase-circuit inversion circuit 52, leak current and a power

supply noise can be controlled.
[0073]Like the modification shown in drawing 10, it may replace with the three-phase-circuit load apparatus 26, and both the neutral point of the three-phase-circuit Y connection load apparatus 28 and the neutral point of the three-phase-circuit Y connection power supply 23 may be connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 using the three-phase-circuit Y connection load apparatus 28. Since the neutral point potential of the three-phase-circuit Y connection load apparatus 28 will be stabilized in addition to the output enhancement effect of the three-phase-circuit inversion circuit 52, and the depressor effect of the instant voltage to the earth potentials impressed to the three-phase-circuit Y connection load apparatus 28 if it does in this way, leak current and a power supply noise can be controlled further.
[0074]
[Effect of the Invention]As mentioned above, according to this invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply as explained, and. Since it is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, and a single phase inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus, Potential of the plane 1 of a three-phase-circuit load apparatus can be made into earth potentials, and the instantaneous value of the voltage of other phases can be controlled at the maximum to the about [abbreviation root2 time] potential of the line voltage of a three-phase-alternating-current power supply. As a result, leak current and a power supply noise can be controlled. Since a general single phase rectification circuit and a general single phase inversion circuit can be used, the miniaturization of an inverter device, reduction of component-parts mark, and low cost-ization are attained. Furthermore, a loss can also be reduced with reduction of component-parts mark.
[0075]According to the next invention, the rate rectification circuit of single phase high tensile consists of a switch element by which antiparallel connection was carried out to the single phase full bridge rectifier and said single phase full bridge rectifier, One of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, is connected to the remaining 2 phase input of a three-phase-circuit load apparatus by the single phase inversion circuit, and by a three-phase-circuit control means. A single phase inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus, and further by the rate rectification control means of high tensile. Since the rate rectification circuit of single phase high tensile is controlled so that the current which flows from a three-phase-alternating-current power supply is formed into an outline sine wave and a power-factor is improved, the current which flows from a three-phase-alternating-current power supply can be formed into an outline sine wave, and a power-factor can be improved.
[0076]According to the next invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means, It is connected to the three-phase-circuit input of a three-phase-circuit load apparatus, and a three-phase-circuit inversion circuit by a keying-circuit control means an opening and closing means, When making the output of a three-phase-circuit inversion circuit into power supply voltage with the three-phase-circuit voltage to the voltage mostly, it will be in a closed circuit state, It is controlled to be in an open state, when making the output of a three-phase-circuit inversion circuit into the three-phase-circuit voltage up to the twice

[about] of power supply voltage, and further by a three-phase-circuit control means. Since a three-phase-circuit inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to the switching condition of an opening and closing means, the output from a three-phase-circuit inversion circuit can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with power supply voltage.

[0077]According to the next invention, a three-phase-circuit rectification circuit is connected to the 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the plane 1 output of a three-phase-alternating-current power supply via an opening and closing means, and. It is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, When an opening and closing means makes the output of a single phase inversion circuit power supply voltage with the three-phase-circuit voltage to the voltage mostly by a keying-circuit control means, it will be in a closed circuit state, It is controlled to be in an open state, when making the output of a single phase inversion circuit into the three-phase-circuit voltage up to 1/about 2 time of power supply voltage, and further by a three-phase-circuit control means. Since a single phase inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to the switching condition of an opening and closing means, the output from a single phase inversion circuit can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to 1/about 2 time of power supply voltage with power supply voltage. And when the output of a single phase inversion circuit is up to 1/about 2 time of power supply voltage. Since the voltage change by switching will be 1/about 2 time, in addition to a bigger effect being acquired to leak current and power supply noise control, the rate of a carrier frequency component over output voltage is controlled, and the ripple component of current and the quasistable state of load can be controlled.

[0078]According to the next invention, a three-phase-circuit rectification circuit is connected to the 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means, and. It is connected to the plane 1 output of a three-phase-alternating-current power supply via the 2nd opening and closing means, is connected to the three-phase-circuit input of a three-phase-circuit load apparatus by the three-phase-circuit inversion circuit, and by a keying-circuit control means. Corresponding to the output voltage range of a three-phase-circuit inversion circuit, each switching condition of the 1st opening and closing means and the 2nd opening and closing means is controlled, and further by a three-phase-circuit control means. Since a three-phase-circuit inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to the switching condition of the 1st opening and closing means and the 2nd opening and closing means, The output from a three-phase-circuit inversion circuit can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with the three-phase-circuit voltage up to 1/about 2 time of power supply voltage, and power supply voltage.

[0079]According to the next invention, a three-phase-circuit rectification circuit is connected to the 3-phase output of a three-phase-alternating-current power supply, Since one of the intermediate connection parts of the capacitors of a smoothing circuit is connected at the neutral point of a three-phase-alternating-current power supply and a three-phase-circuit inversion circuit is connected to the three-phase-circuit input of a three-phase-circuit load apparatus, Since the instant voltage to the earth potentials which can increase and are further impressed to a three-phase-circuit load apparatus can also control the output of a three-phase-circuit inversion circuit, leak current and a power supply noise can be controlled.

[0080]According to the next invention, since it is connected also at the neutral point of a three-phase-circuit load apparatus, as for the intermediate connection part of the capacitors of a

smoothing circuit, the neutral point potential of a three-phase-circuit load apparatus is stabilized, and it can control leak current and a power supply noise further.

[Translation done.]

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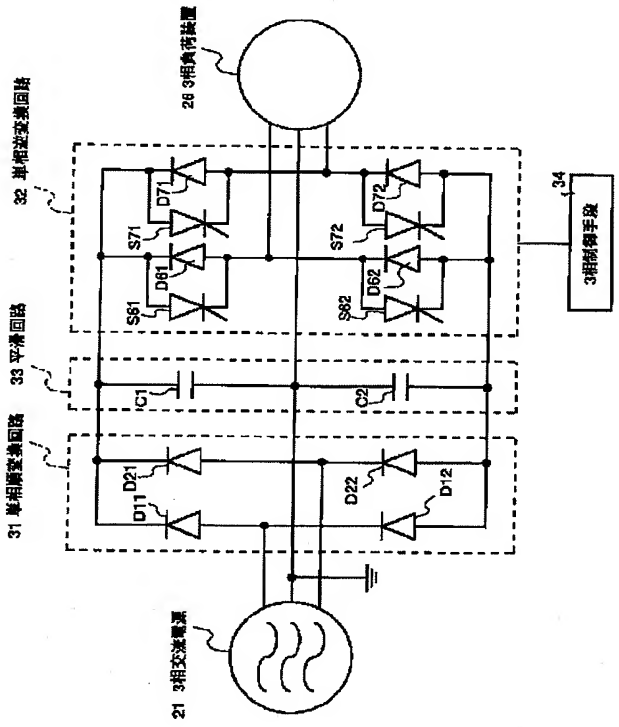
(54)【発明の名称】　３相インバータ装置

(57)【要約】
【課題】　３相インバータ装置において、漏洩電流および電源ノイズを抑制し、さらには小型化、構成部品点数の削減および低コスト化を実現すること。
【解決手段】　３相交流電源２１の、単相順変換回路３１に未接続の１相を、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部に接続すると共に、３相負荷装置２６の、単相逆変換回路３２に未接続の１相に接続することにより、コンデンサＣ１，Ｃ２にそれぞれ印加される直流電圧を、接地電位を基準として最大で３相交流電源２１の線間電圧の約２倍程度の電位に固定し、それを３相逆変換回路３２を経て３相負荷装置２６に印加する。それによって３相負荷装置２６の１相の電位を接地電位とし、他の相の電圧の瞬時値を、最大で３相交流電源２１の線間電圧の約２倍程度の電位に抑制する。



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【特許請求の範囲】

【請求項１】　３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、

３相交流電源の３相出力のうちの２相に接続される単相順変換回路と、

前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続される平滑回路と、

前記平滑回路に接続され、かつ前記３相負荷装置の残りの２相入力に接続される単相逆変換回路と、

前記３相負荷装置に３相交流電圧を供給するように前記単相逆変換回路を制御する３相制御手段と、

を具備することを特徴とする３相インバータ装置。

【請求項２】　３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、

単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなる単相高力率順変換回路と、

前記単相高力率順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続される平滑回路と、

前記平滑回路に接続され、かつ前記３相負荷装置の残りの２相入力に接続される単相逆変換回路と、

前記３相負荷装置に３相交流電圧を供給するように前記単相逆変換回路を制御する３相制御手段と、

前記３相交流電源から流入する電流を概略正弦波化して力率を改善するように前記単相高力率順変換回路を制御する高力率順変換制御手段と、

を具備することを特徴とする３相インバータ装置。

【請求項３】　３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、

３相交流電源の３相出力のうちの２相に接続される単相順変換回路と、

前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に、回路の開閉を切り替えるための開閉手段を介して接続され得る平滑回路と、

前記平滑回路に接続され、かつ前記３相負荷装置の３相入力に接続される３相逆変換回路と、

前記３相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態とし、また前記３相逆変換回路の出力を電源電圧のほぼ２倍までの３相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、

前記開閉手段の開閉状態に対応して前記３相負荷装置に３相交流電圧を供給するように前記３相逆変換回路を制御する３相制御手段と、

を具備することを特徴とする３相インバータ装置。

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【請求項４】　３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、

３相交流電源の３相出力に接続される３相順変換回路と、

前記３相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の１相出力に、回路の開閉を切り替えるための開閉手段を介して接続され得ると共に、３相負荷装置の３相入力のうちの１相に接続される平滑回路と、

前記平滑回路に接続され、かつ前記３相負荷装置の残りの２相入力に接続される単相逆変換回路と、

前記単相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態とし、また前記単相逆変換回路の出力を電源電圧のほぼ２分の１倍までの３相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、

前記開閉手段の開閉状態に対応して前記３相負荷装置に３相交流電圧を供給するように前記単相逆変換回路を制御する３相制御手段と、

を具備することを特徴とする３相インバータ装置。

【請求項５】　３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、

３相交流電源の３相出力に接続される３相順変換回路と、

前記３相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、３相負荷装置の３相入力のうちの１相に、回路の開閉を切り替えるための第１の開閉手段を介して接続され得ると共に、前記３相交流電源の１相出力に、回路の開閉を切り替えるための第２の開閉手段を介して接続され得る平滑回路と、

前記平滑回路に接続され、かつ前記３相負荷装置の３相入力に接続される３相逆変換回路と、

前記３相逆変換回路の出力電圧範囲に対応して前記第１の開閉手段および前記第２の開閉手段のそれぞれの開閉状態を制御する開閉回路制御手段と、

前記第１の開閉手段および前記第２の開閉手段の開閉状態に対応して前記３相負荷装置に３相交流電圧を供給するように前記３相逆変換回路を制御する３相制御手段と、

を具備することを特徴とする３相インバータ装置。

【請求項６】　３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、

３相交流電源の３相出力に接続される３相順変換回路と、

前記３相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが前記３相交流電源の中性点に接続される平滑回路と、

前記平滑回路に接続され、かつ前記３相負荷装置の３相入力に接続される３相逆変換回路と、

を具備することを特徴とする３相インバータ装置。

【請求項７】　前記平滑回路のコンデンサどうしの前記中間接続部が、前記３相負荷装置の中性点にも接続されることを特徴とする請求項６に記載の３相インバータ装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、３相交流電源の電圧および周波数を変換して出力する３相インバータ装置に関する。

【０００２】

【従来の技術】図１１は、一般的な３相インバータ装置の構成を示すブロック図である。このインバータ装置は、一対のダイオードを直列接続したダイオード列が三つ並列に接続された構成の３相順変換回路１１と、一対のダイオードを直列接続したダイオード列が三つ並列に接続され、かつ各ダイオードに一つずつスイッチ素子が逆並列接続された構成の３相逆変換回路１２と、平滑コンデンサ１３とが並列に接続された構成となっている。なお、逆並列接続とは、二つの素子が極性を反対にして並列に接続されていることを意味する。

【０００３】３相順変換回路１１の三つのダイオード列において、それぞれの列の一対のダイオードの中間接続部には、３相交流電源２１の３相が１相ずつ供給されている。

【０００４】３相逆変換回路１２の３相の出力は、３相逆変換回路１２の三つのダイオード列において、それぞれの列の一対のダイオードの中間接続部から、３相負荷装置２６の各相に１相ずつ供給されている。

【０００５】図１１に示す構成の３相インバータ装置では、３相交流電源２１の１相が接地されている場合、接地電位に対して不特定の電位が３相負荷装置２６に印加されることが知られている。その印加される不特定電位は、３相逆変換回路１２内のスイッチ素子により高速に変化し、また３相負荷装置２６と接地電位との間の浮遊容量により漏れ電流が大きくなるため、電源ノイズや漏洩電流の増加原因となっている。そのため、その不特定電位の影響をできるだけ抑制するのが好ましい。またインバータ装置の小型化、構成部品点数の削減、低コスト化も要求される。

【０００６】ところで単相インバータ回路では、漏洩電流および電源ノイズを低減するための対策を施した回路が提案されている（富士時報、Ｖｏｌ．７１、Ｎｏ．７、ｐ．４０７－４１０、１９９８）。この単相インバータ回路は、図１２に示すように、一対のダイオードを直列接続し、かつ各ダイオードに一つずつスイッチ素子を逆並列接続した構成の単相高力率コンバータ回路１４と、一対のダイオードを直列接続し、かつ各ダイオードに一つずつスイッチ素子を逆並列接続した構成の単相逆変換回路１５と、一対のコンデンサを直列接続した平滑回路１６とが並列に接続された構成となっている。

【０００７】そして単相交流電源２２の２相のうちの一方の出力相は、交流リアクトル１７を介して単相高力率コンバータ回路１４の一対のダイオードの中間接続部に供給されているとともに、単相交流電源２２の他方の出力相は、平滑回路１６の一対のコンデンサの中間接続部および単相逆変換回路出力部２７の一方の出力相に供給されている。また単相逆変換回路出力部２７のもう一方の出力相には、単相逆変換回路１５の一対のダイオードの中間接続部からの出力が供給される。

【０００８】この図１２に示す単相インバータ回路によれば、漏洩電流および電源ノイズの両方を抑制し、さらには小型化、構成部品点数の削減および低コスト化を実現することができるという効果が得られるとしている。

【０００９】

【発明が解決しようとする課題】しかしながら、３相インバータ装置では、上述した単相インバータ回路のように漏洩電流の抑制および電源ノイズの抑制を実現することは未だ困難であり、またインバータ装置の小型化、構成部品点数の削減および低コスト化等の要求を満たすことも困難である。

【００１０】本発明は、上記事情に鑑みなされたもので、３相インバータ装置において、漏洩電流および電源ノイズを抑制し、さらには小型化、構成部品点数の削減および低コスト化を実現することができる３相インバータ装置を得ることを目的とする。

【００１１】

【課題を解決するための手段】上記目的を達成するため、本発明は、３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、３相交流電源の３相出力のうちの２相に接続される単相順変換回路と、前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続される平滑回路と、前記平滑回路に接続され、かつ前記３相負荷装置の残りの２相入力に接続される単相

逆変換回路と、前記３相負荷装置に３相交流電圧を供給するように前記単相逆変換回路を制御する３相制御手段と、を具備する。

【００１２】この発明によれば、単相順変換回路が３相交流電源の３相出力のうちの２相に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続され、単相逆変換回路が３相負荷装置の残りの２相入力に接続され、３相制御手段により、３相負荷装置に３相交流電圧が供給されるように単相逆変換回路が制御される。

【００１３】また本発明は、３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなる単相高力率順変換回路と、前記単相高力率順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続される平滑回路と、前記平滑回路に接続され、かつ前記３相負荷装置の残りの２相入力に接続される単相逆変換回路と、前記３相負荷装置に３相交流電圧を供給するように前記単相逆変換回路を制御する３相制御手段と、前記３相交流電源から流入する電流を概略正弦波化して力率を改善するように前記単相高力率順変換回路を制御する高力率順変換制御手段と、を具備する。

【００１４】この発明によれば、単相高力率順変換回路が、単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなり、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続され、単相逆変換回路が３相負荷装置の残りの２相入力に接続され、３相制御手段により、３相負荷装置に３相交流電圧が供給されるように単相逆変換回路が制御され、さらに高力率順変換制御手段により、３相交流電源から流入する電流が概略正弦波化されて力率が改善されるように単相高力率順変換回路が制御される。

【００１５】また本発明は、３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、３相交流電源の３相出力のうちの２相に接続される単相順変換回路と、前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に、回路の開閉を切り替えるための開閉手段を介して接続され得る平滑回路と、前記平滑回路に接続され、かつ前記３相負荷装置の３相入力に接続される３相逆変換回路と、前記３相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態とし、また前記３相逆変換回路の出力を電源電圧のほぼ２倍までの３相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、前記開閉手段の開閉状態に対応して前記３相負荷装置に３相交流電圧を供給するように前記３相逆変換回路を制御する３相制御手段と、を具備する。

【００１６】この発明によれば、単相順変換回路が３相交流電源の３相出力のうちの２相に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に開閉手段を介して接続され、３相逆変換回路が３相負荷装置の３相入力に接続され、開閉回路制御手段により開閉手段が、３相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態となり、また３相逆変換回路の出力を電源電圧のほぼ２倍までの３相電圧とする場合に開路状態となるように制御され、さらに３相制御手段により、開閉手段の開閉状態に対応して３相負荷装置に３相交流電圧が供給されるように３相逆変換回路が制御される。

【００１７】また本発明は、３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、３相交流電源の３相出力に接続される３相順変換回路と、前記３相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記３相交流電源の１相出力に、回路の開閉を切り替えるための開閉手段を介して接続され得ると共に、３相負荷装置の３相入力のうちの１相に接続される平滑回路と、前記平滑回路に接続され、かつ前記３相負荷装置の残りの２相入力に接続される単相逆変換回路と、前記単相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態とし、また前記単相逆変換回路の出力を電源電圧のほぼ２分の１倍までの３相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、前記開閉手段の開閉状態に対応して前記３相負荷装置に３相交流電圧を供給するように前記単相逆変換回路を制御する３相制御手段と、を具備する。

【００１８】この発明によれば、３相順変換回路が３相交流電源の３相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の１相出力に開閉手段を介して接続されると共に、３相負荷装置の３相入力のうちの１相に接続され、単相逆変換回路が３相負荷装置の残りの２相入力に接続され、開閉回路制御手段により開閉手段が、単相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態となり、また単相逆変換回路の出力を電源電圧のほぼ２分

の１倍までの３相電圧とする場合に開路状態となるように制御され、さらに３相制御手段により、開閉手段の開閉状態に対応して３相負荷装置に３相交流電圧が供給されるように単相逆変換回路が制御される。

【００１９】また本発明は、３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、３相交流電源の３相出力に接続される３相順変換回路と、前記３相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、３相負荷装置の３相入力のうちの１相に、回路の開閉を切り替えるための第１の開閉手段を介して接続され得ると共に、前記３相交流電源の１相出力に、回路の開閉を切り替えるための第２の開閉手段を介して接続され得る平滑回路と、前記平滑回路に接続され、かつ前記３相負荷装置の３相入力に接続される３相逆変換回路と、前記３相逆変換回路の出力電圧範囲に対応して前記第１の開閉手段および前記第２の開閉手段のそれぞれの開閉状態を制御する開閉回路制御手段と、前記第１の開閉手段および前記第２の開閉手段の開閉状態に対応して前記３相負荷装置に３相交流電圧を供給するように前記３相逆変換回路を制御する３相制御手段と、を具備する。

【００２０】この発明によれば、３相順変換回路が３相交流電源の３相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相負荷装置の３相入力のうちの１相に第１の開閉手段を介して接続されると共に、３相交流電源の１相出力に第２の開閉手段を介して接続され、３相逆変換回路が３相負荷装置の３相入力に接続され、開閉回路制御手段により、３相逆変換回路の出力電圧範囲に対応して第１の開閉手段および第２の開閉手段のそれぞれの開閉状態が制御され、さらに３相制御手段により、第１の開閉手段および第２の開閉手段の開閉状態に対応して３相負荷装置に３相交流電圧が供給されるように３相逆変換回路が制御される。

【００２１】また本発明は、３相交流電源の電圧および周波数の一方または両方を変換して３相負荷装置に出力するインバータ装置であって、３相交流電源の３相出力に接続される３相順変換回路と、前記３相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが前記３相交流電源の中性点に接続される平滑回路と、前記平滑回路に接続され、かつ前記３相負荷装置の３相入力に接続される３相逆変換回路と、を具備する。

【００２２】この発明によれば、３相順変換回路が３相交流電源の３相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが３相交流電源の中性点に接続され、３相逆変換回路が３相負荷装置の３相入力に接続される。

【００２３】この発明において、前記平滑回路のコンデンサどうしの前記中間接続部が、前記３相負荷装置の中性点にも接続されていてもよい。

【００２４】この発明によれば、平滑回路のコンデンサどうしの中間接続部は３相負荷装置の中性点にも接続される。

【００２５】

【発明の実施の形態】以下、添付図面を参照して、本発明にかかる３相インバータ装置の実施の形態を詳細に説明する。

【００２６】実施の形態１．図１は、本発明の実施の形態１にかかる３相インバータ装置の構成を示すブロック図である。このインバータ装置は、一対のダイオードＤ１１，Ｄ１２を直列接続したダイオード列と一対のダイオードＤ２１，Ｄ２２を直列接続したダイオード列とが並列に接続された構成の単相順変換回路３１と、一対のダイオードＤ６１，Ｄ６２を直列接続したダイオード列と一対のダイオードＤ７１，Ｄ７２を直列接続したダイオード列とが並列に接続され、かつ各ダイオードＤ６１，Ｄ６２，Ｄ７１，Ｄ７２に一つずつスイッチ素子Ｓ６１，Ｓ６２，Ｓ７１，Ｓ７２が逆並列接続された構成の単相逆変換回路３２と、一対のコンデンサＣ１，Ｃ２を直列接続した平滑回路３３とが並列に接続された構成となっている。

【００２７】単相順変換回路３１の二つのダイオード列において、ダイオードＤ１１とダイオードＤ１２との中間接続部、およびダイオードＤ２１とダイオードＤ２２との中間接続部には、３相交流電源２１の３相のうちの２相が１相ずつ供給されている。３相交流電源２１の残りの１相は、接地され、かつ平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部、および３相負荷装置２６の３相の入力のうちの１相に供給されている。３相負荷装置２６の入力の残りの２相には、単相逆変換回路３２のダイオードＤ６１とダイオードＤ６２との中間接続部からの出力、およびダイオードＤ７１とダイオードＤ７２との中間接続部からの出力がそれぞれ供給される。

【００２８】単相逆変換回路３２は３相制御手段３４により制御されている。３相制御手段３４は、３相負荷装置２６に３相交流電圧を供給するように制御するための手段である。

【００２９】つぎに実施の形態１の作用について説明する。３相交流電源２１の、単相順変換回路３１に未接続の１相が、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部に接続されていることよって、３相交流電源２１の線間電圧の約√２倍程度の電位が、平滑回路３３の両コンデンサＣ１，Ｃ２のそれぞれの両極間に印加される。また３相制御手段３４により平滑回路３３の中間接続部からの出力に対して単相逆変換回路３２の１相の出力を制御し、それによって３相負荷装置２６

の一線間に、所望の電圧値および周波数を有する電圧ＶRSを印加する。

【００３０】また３相制御手段３４により平滑回路３３の中間接続部からの出力に対して単相逆変換回路３２の残りの１相の出力を制御し、それによって３相負荷装置２６の他の線間に、電圧VRSに対して位相が１２０°異なる電圧VSTを印加する。電圧VRSおよび電圧VSTにより、残りの電圧VTRが自然に定まるので、単相逆変換回路３２の構成でもって３相交流出力を得ることができる。

【００３１】実施の形態１によれば、３相交流電源２１の、単相順変換回路３１に未接続の１相が、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部に接続され、かつ３相負荷装置２６の、単相逆変換回路３２に未接続の１相に接続されているため、コンデンサＣ１，Ｃ２にそれぞれ印加される直流電圧は、接地電位を基準として最大で３相交流電源２１の線間電圧の約√２倍程度の電位に固定され、その直流電圧が３相逆変換回路３２を経て３相負荷装置２６に印加されるので、３相負荷装置２６の１相の電位を接地電位とし、他の相の電圧の瞬時値を、最大で３相交流電源２１の線間電圧の約√２倍程度の電位に抑制することができる。その結果、漏洩電流および電源ノイズを抑制することができる。

【００３２】また実施の形態１によれば、順変換回路３１の構成が一般的な単相順変換回路と同様であり、また逆変換回路３２の構成も一般的な単相逆変換回路と同様であるため、インバータ装置の小型化、構成部品点数の削減および低コスト化が可能となる。さらに構成部品点数の削減に伴い、損失も低減できる。

【００３３】なお、上記構成のインバータ装置に交流リアクトルおよび直流リアクトルを任意に組み合わせてもよく、そうすれば電源の力率を改善することができると共に、電流の高調波成分を抑制することができる。

【００３４】実施の形態２．図２は、本発明の実施の形態２にかかる３相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態１と異なるのは、単相順変換回路３１の代わりに単相高力率順変換回路４１を設けたことと、単相高力率順変換回路４１の３相交流電源２１側にそれぞれ交流リアクトル４２，４３を接続したことと、単相高力率順変換回路４１を制御する高力率順変換制御手段４４を設けたことである。その他の構成は上記実施の形態１（図１参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【００３５】単相高力率順変換回路４１は、一対の単相フルブリッジ整流器Ｄ１１１，Ｄ１１２を直列接続した整流器列と一対の単相フルブリッジ整流器Ｄ１２１，Ｄ１２２を直列接続した整流器列とが並列に接続され、かつ各単相フルブリッジ整流器Ｄ１１１，Ｄ１１２，Ｄ１２１，Ｄ１２２に一つずつスイッチ素子Ｓ１１１，Ｓ１１２，Ｓ１２１，Ｓ１２２が逆並列接続された構成となっている。

【００３６】高力率順変換制御手段４４は、３相交流電源２１から流入する電流を概略正弦波化し、力率改善を可能とするよう単相高力率順変換回路４１の制御を行う。

【００３７】つぎに実施の形態２の作用について説明する。単相高力率順変換回路４１の内部の１相出力と、３相交流電源２１の、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続点に接続された相との間で、所望の電圧値および周波数を有する電圧VRS__convが発生する。この電圧VRS__convは電源相電圧VRSに対して、交流リアクトル間に印加され、それによって流れる電源電流が決まる。従って高力率順変換制御手段４４により単相高力率順変換回路４１を制御し、電源電流を概略正弦波化し、力率を改善し得るような電圧VRS__convを発生させる。

【００３８】単相高力率順変換回路４１の内部の他の１相出力と、３相交流電源２１の、コンデンサＣ１とコンデンサＣ２との中間接続点に接続された相との間についても、高力率順変換制御手段４４により同様の制御を行い、電源電流を概略正弦波化し、力率を改善し得るような電圧VST__convを発生させる。

【００３９】逆変換回路３２の制御については実施の形態１と同様であるので、説明を省略する。

【００４０】実施の形態２によれば、実施の形態１と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られるのに加えて、３相交流電源２１の順変換回路として単相高力率順変換回路４１を用いたため、３相交流電源２１から流入する電流を概略正弦波化し、力率を改善することができるという効果が得られる。

【００４１】実施の形態３．図３は、本発明の実施の形態３にかかる３相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態１と異なるのは、単相逆変換回路３２の代わりに３相逆変換回路５２を設け、３相逆変換回路５２の３相の出力を３相負荷装置２６の各相に１相ずつ供給するようにしたことと、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部を、３相逆変換回路５２の１相部分の出力点にスイッチ等の開閉手段５４を介して接続したことと、その開閉手段５４の開閉を制御する開閉回路制御手段５５を設けたことと、３相逆変換回路５２を制御するための３相制御手段５６を設けたことである。その他の構成は上記実施の形態１（図１参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【００４２】３相逆変換回路５２は、一対のダイオードＤ２６１，Ｄ２６２を直列接続したダイオード列と一対

のダイオードＤ２７１，Ｄ２７２を直列接続したダイオード列と一対のダイオードＤ２８１，Ｄ２８２を直列接続したダイオード列とが並列に接続され、かつ各ダイオードＤ２６１，Ｄ２６２，Ｄ２７１，Ｄ２７２，Ｄ２８１，Ｄ２８２に一つずつスイッチ素子Ｓ２６１，Ｓ２６２，Ｓ２７１，Ｓ２７２，Ｓ２８１，Ｓ２８２が逆並列接続された構成となっている。３相逆変換回路５２の３相の出力は、各ダイオード列の一対のダイオードの中間接続部から、３相負荷装置２６の各相に１相ずつ供給されている。

【００４３】開閉回路制御手段５５は、開閉手段５４に対して、３相逆変換回路５２から電源電圧とほぼ同電圧までの３相電圧を出力させる場合には閉路状態とし、前記３相逆変換回路１０の出力可能電圧を電源電圧のほぼ２倍までとする場合には開路状態とするように制御する。

【００４４】３相制御手段５６は、３相逆変換回路５２に対して、開閉手段５４の開閉状態に応じて３相負荷装置２６に３相交流電圧を供給するように制御する。

【００４５】図４は、実施の形態３のインバータ装置の動作を説明するためのフローチャートである。まず３相逆変換回路５２の出力電圧Ｖout の範囲が３相交流電源２１の線間電圧Ｖinより大きいか否かの判定を行う（ステップＳ１）。そしてＶoutがＶin以上の時、すなわち３相交流電源２１の線間電圧Ｖin以上の出力電圧を必要とする場合には、開閉手段５４を開状態とし、３相逆変換回路５２内の１相アームと平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部との接続を遮断する（ステップＳ２）。

【００４６】その状態で３相制御手段５６により３相逆変換回路５２の３相アームをそれぞれ制御し、３相逆変換回路５２の各出力相の相電圧を平滑回路３３の低電圧側に対する高電圧側の電位である３相線間電圧の約２√２倍の電圧でスイッチング制御する（ステップＳ３）。それによって３相負荷装置２６に３相交流電圧を印加し、一連の制御を終了する。

【００４７】一方ステップＳ１でＶout がＶinよりも小さい時、すなわち３相交流電源２１の線間電圧Ｖinより小さい出力電圧を必要とする場合には、開閉手段５４を閉状態とし、３相逆変換回路５２内の１相アームと平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部とを接続する（ステップＳ４）。そして３相逆変換回路５２内の、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続されていない２相に関して、上記実施の形態１と同様の制御を実現し得るように３相制御手段５６を制御し（ステップＳ５）、一連の制御を終了する。

【００４８】実施の形態３によれば、３相逆変換回路５２からの出力電圧を切り替えるための開閉手段５４を設け、その開閉手段５４の開閉状態を切り替え制御するようにしたため、３相逆変換回路５２からの出力を、電源電圧とほぼ同電圧までの３相電圧と、電源電圧のほぼ２倍までの３相電圧とに切り替えることができる。そして３相逆変換回路５２から電源電圧とほぼ同電圧までの３相電圧を出力させる場合には、上記実施の形態１と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られる。

【００４９】実施の形態４．図５は、本発明の実施の形態４にかかる３相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態１と異なるのは、単相順変換回路３１の代わりに３相順変換回路６１を設け、３相順変換回路６１の３相に３相交流電源２１の３相出力を１相ずつ供給するようにしたことと、３相交流電源２１の３相のうちの接地された１相を、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部にスイッチ等の開閉手段６４を介して接続したことと、その開閉手段６４の開閉を制御する開閉回路制御手段６５を設けたことである。その他の構成は上記実施の形態１（図１参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【００５０】３相順変換回路６１は、一対のダイオードＤ３１１，Ｄ３１２を直列接続したダイオード列と一対のダイオードＤ３２１，Ｄ３２２を直列接続したダイオード列と一対のダイオードＤ３３１，Ｄ３３２を直列接続したダイオード列とが並列に接続された構成となっている。３相交流電源２１の出力は、各ダイオード列の一対のダイオードの中間接続部に１相ずつ供給される。

【００５１】開閉回路制御手段６５は、開閉手段６４に対して、３相負荷装置２６に電源電圧のほぼ２分の１（１／２）までの３相電圧を出力する場合には開路状態とし、３相負荷装置２６への出力可能電圧を電源電圧とほぼ同電圧までとする場合には閉路状態とするように制御する。

【００５２】図６は、実施の形態４のインバータ装置の動作を説明するためのフローチャートである。まず単相逆変換回路３２の出力電圧Ｖout の範囲が３相交流電源２１の線間電圧Ｖinより大きいか否かの判定を行う（ステップＳ１１）。そしてＶout がほぼＶinとほぼ同じ電圧までの時、すなわち３相交流電源２１の線間電圧Ｖinとほぼ同電圧までの出力電圧を必要とする場合には、開閉手段６４を閉状態とし、３相順変換回路６１内の１相アームと平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部とを接続する（ステップＳ１２）。その状態で３相制御手段３４により単相逆変換回路３２に対して上記実施の形態１と同様の制御を行い（ステップＳ１４）、３相負荷装置２６に３相交流電圧を印加し、一連の制御を終了する。

【００５３】一方ステップＳ１１でＶout がＶinのほぼ２分の１（１／２）倍の電圧までの時、すなわち３相交

流電源２１の線間電圧Ｖinのほぼ２分の１（１／２）倍までの出力電圧を必要とする場合には、開閉手段６４を開状態とし、３相順変換回路６１内の１相アームと平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部との接続を遮断し（ステップＳ１３）、ステップＳ１４へ進み、３相負荷装置２６に３相交流電圧を印加して一連の制御を終了する。

【００５４】実施の形態４によれば、単相逆変換回路３２からの出力電圧を切り替えるための開閉手段６４を設け、その開閉手段６４の開閉状態を切り替え制御するようにしたため、単相逆変換回路３２からの出力を、電源電圧とほぼ同電圧までの３相電圧と、電源電圧のほぼ２分の１（１／２）倍までの３相電圧とに切り替えることができる。そして単相逆変換回路３２から電源電圧とほぼ同電圧までの３相電圧を出力させる場合には、上記実施の形態１と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られる。

【００５５】また単相逆変換回路３２から電源電圧のほぼ２分の１（１／２）倍までの３相電圧を出力させる場合には、スイッチングによる電圧変化がほぼ２分の１（１／２）倍となるので、漏洩電流および電源ノイズ抑制に対しより大きな効果が得られるのに加えて、出力電圧に対するキャリア周波数成分の割合が抑制され、電流のリプル成分や、負荷の不安定状態を抑制することができる。

【００５６】実施の形態５．図７は、本発明の実施の形態５にかかる３相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態１と異なるのは、単相順変換回路３１の代わりに３相順変換回路６１を設け、３相順変換回路６１の３相に３相交流電源２１の３相出力を１相ずつ供給するようにしたことと、単相逆変換回路３２の代わりに３相逆変換回路５２を設け、３相逆変換回路５２の３相の出力を３相負荷装置２６の各相に１相ずつ供給するようにしたことと、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部を、３相逆変換回路５２の１相部分の出力点にスイッチ等の第１の開閉手段５４を介して接続したことと、３相交流電源２１の３相のうちの接地された１相を、平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部にスイッチ等の第２の開閉手段６４を介して接続したことと、第１の開閉手段５４および第２の開閉手段６４の開閉をそれぞれ制御する第１の開閉回路制御手段５５および第２の開閉回路制御手段６５を設けたことと、３相逆変換回路５２を制御するための３相制御手段５６を設けたことである。その他の構成は上記実施の形態１（図１参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【００５７】３相逆変換回路５２、第１の開閉手段５４、第１の開閉回路制御手段５５および３相制御手段５６は、それぞれ図３に示す実施の形態３の３相逆変換回路５２、開閉手段５４、開閉回路制御手段５５および３相制御手段５６と同様の構成のものである。従ってそれら回路および各手段の説明は、重複するため省略する。

【００５８】３相順変換回路６１、第２の開閉手段６４および第２の開閉回路制御手段６５は、それぞれ図５に示す実施の形態４の３相順変換回路６１、開閉手段６４および開閉回路制御手段６５と同様の構成のものである。従ってそれら回路および各手段の説明は、重複するため省略する。

【００５９】図８は、実施の形態５のインバータ装置の動作を説明するためのフローチャートである。まず３相逆変換回路５２の出力電圧Ｖout の範囲が３相交流電源２１の線間電圧Ｖinより大きいか否かの判定を行う（ステップＳ２１）。そしてＶout がＶin以上の時、すなわち３相交流電源２１の線間電圧Ｖinのほぼ２倍までの出力電圧を必要とする場合には、第２の開閉回路制御手段６５により第２の開閉手段６４を閉路状態とし、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部を３相交流電源２１に接続する（ステップＳ２２）。

【００６０】そして第１の開閉回路制御手段５５により第１の開閉手段５４を開路状態とし、３相逆変換回路５２内の１相アームと平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部との接続を遮断する（ステップＳ２３）。その状態で３相制御手段５６により３相逆変換回路５２の３相アームをそれぞれ制御し、３相逆変換回路５２の各出力相の相電圧を平滑回路３３の低電圧側に対する高電圧側の電位である３相線間電圧の約$2\sqrt{2}$倍の電圧でスイッチング制御し（ステップＳ２４）、３相負荷装置２６に３相交流電圧を印加し、一連の制御を終了する。

【００６１】一方ステップＳ２１でＶout がＶinよりも小さい時、すなわち３相交流電源２１の線間電圧Ｖinより小さい出力電圧を必要とする場合には、Ｖout がＶinのほぼ２分の１（１／２）倍であるか否かの判定を行う（ステップＳ２５）。ＶoutがＶinのほぼ２分の１（１／２）倍である場合には、さらに３相交流電源２１の電流の３相平衡を重視するか否かの判断を行う（ステップＳ２６）。

【００６２】ステップＳ２６で３相平衡を重視する場合には、第２の開閉回路制御手段６５により第２の開閉手段６４を開路状態とし、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部と３相交流電源２１との接続を遮断する（ステップＳ２７）。そして第１の開閉回路制御手段５５により第１の開閉手段５４を開路状態とし、３相逆変換回路５２内の１相アームと平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部との接続を遮断する（ステップＳ２８）。

【００６３】その状態で３相制御手段５６により３相逆

変換回路５２の３相アームをそれぞれ制御し、３相逆変換回路５２の各出力相の相電圧を平滑回路３３の低電圧側に対する高電圧側の電位である３相線間電圧の約√２倍の電圧でスイッチング制御し（ステップＳ２９）、３相負荷装置２６に３相交流電圧を印加し、一連の制御を終了する。

【００６４】ステップＳ２６で３相平衡を重視せずに、漏洩電流および電源ノイズの抑制を重視する場合には、第２の開閉回路制御手段６５により第２の開閉手段６４を閉路状態とし、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部を３相交流電源２１に接続する（ステップＳ３０）。そして第１の開閉回路制御手段５５により第１の開閉手段５４を閉路状態とし、３相逆変換回路５２内の１相アームを平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続する（ステップＳ３１）。その状態で３相制御手段５６により、３相逆変換回路５２内の、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続されていない２相に関して、上記実施の形態１と同様の制御を行い（ステップＳ３２）、３相負荷装置２６に３相交流電圧を印加して一連の制御を終了する。

【００６５】ステップＳ２５でVout がVinのほぼ２分の１（１／２）倍ではない場合には、第２の開閉回路制御手段６５により第２の開閉手段６４を開路状態とし、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部と３相交流電源２１との接続を遮断する（ステップＳ３３）。そして第１の開閉回路制御手段５５により第１の開閉手段５４を閉路状態とし、３相逆変換回路５２内の１相アームを平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続する（ステップＳ３４）。その状態で３相制御手段５６により、３相逆変換回路５２内の、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続されていない２相に関して、上記実施の形態１と同様の制御を行い（ステップＳ３５）、３相負荷装置２６に３相交流電圧を印加して一連の制御を終了する。

【００６６】実施の形態５によれば、３相逆変換回路５２からの出力電圧を切り替えるための第１の開閉手段５４および第２の開閉手段６４を設け、それら第１および第２の開閉手段５４，６４の開閉状態を切り替え制御するようにしたため、３相逆変換回路５２からの出力を、電源電圧のほぼ２分の１（１／２）倍までの３相電圧と、電源電圧とほぼ同電圧までの３相電圧と、電源電圧のほぼ２倍までの３相電圧とに切り替えることができる。そして３相逆変換回路５２から電源電圧とほぼ同電圧までの３相電圧を出力させる場合には、上記実施の形態１と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られる。

【００６７】また３相逆変換回路５２から電源電圧のほぼ２分の１（１／２）倍までの３相電圧を出力させる場合には、スイッチングによる電圧変化がほぼ２分の１（１／２）倍となるので、漏洩電流および電源ノイズ抑制に対しより大きな効果が得られるのに加えて、出力電圧に対するキャリア周波数成分の割合が抑制され、電流のリプル成分や、負荷の不安定状態を抑制することができる。

【００６８】実施の形態６．図９は、本発明の実施の形態６にかかる３相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態１と異なるのは、３相交流電源２１に代えて３相Ｙ接続電源２３を用いたことと、単相順変換回路３１の代わりに３相順変換回路６１を設け、３相順変換回路６１の３相に３相Ｙ接続電源の３相出力を１相ずつ供給するようにしたことと、単相逆変換回路３２の代わりに３相逆変換回路５２を設け、３相逆変換回路５２の３相の出力を３相負荷装置２６の各相に１相ずつ供給するようにしたことと、３相Ｙ接続電源の中性点に平滑回路３３のコンデンサＣ１とコンデンサＣ２との中間接続部を接続したことである。その他の構成は上記実施の形態１（図１参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【００６９】３相逆変換回路５２および３相順変換回路６１は、それぞれ図３に示す実施の形態３の３相逆変換回路５２、および図５に示す実施の形態４の３相順変換回路６１と同様の構成のものである。従ってそれらの回路の説明は、重複するため省略する。

【００７０】つぎに実施の形態６の作用について説明する。平滑回路３３の、３相Ｙ接続電源２３との接続点と、平滑回路３３の上位電位側との間の電圧は、３相Ｙ接続電源２３の相電圧実効値の約√２倍となる。同様に平滑回路３３の、３相Ｙ接続電源２３との接続点と、平滑回路３３の下位電位側との間の電圧も３相Ｙ接続電源２３の相電圧実効値の約√２倍となる。従って３相逆変換回路５２に印加される直流電圧は、３相Ｙ接続電源２３の相電圧実効値の約２√２倍となり、３相逆変換回路５２の正弦波出力線間出力電圧実効値は、３相Ｙ接続電源２３の相電圧実効値の約√３倍となる。

【００７１】それに対して３相Ｙ接続電源２３の中性点を平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続しない場合には、３相逆変換回路５２に印加される直流電圧は、３相Ｙ接続電源２３の相電圧実効値の約√６倍となり、３相逆変換回路５２の正弦波出力線間出力電圧実効値は、相電圧実効値の約２分の３（３／２）倍までである。従って３相Ｙ接続電源２３の中性点を平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続したことにより、出力電圧が約１５％増大する。

【００７２】実施の形態６によれば、３相Ｙ接続電源２３の中性点を平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に接続したため、３相逆変換回路５２の出力を増大することができ、さらには３相負荷装置２６に印加

される接地電位に対する瞬時電圧も抑制できるので、漏洩電流および電源ノイズを抑制することができる。

【００７３】なお、図１０に示す変形例のように、３相負荷装置２６に代えて３相Ｙ接続負荷装置２８を用い、平滑回路３３のコンデンサＣ１，Ｃ２の中間接続部に３相Ｙ接続負荷装置２８の中性点と３相Ｙ接続電源２３の中性点の両方を接続してもよい。このようにすれば、３相逆変換回路５２の出力増大効果、および３相Ｙ接続負荷装置２８に印加される接地電位に対する瞬時電圧の抑制効果に加えて、３相Ｙ接続負荷装置２８の中性点電位が安定するため、漏洩電流および電源ノイズをより一層抑制することができる。

【００７４】

【発明の効果】以上、説明したとおり、本発明によれば、単相順変換回路が３相交流電源の３相出力のうちの２相に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続され、単相逆変換回路が３相負荷装置の残りの２相入力に接続され、３相制御手段により、３相負荷装置に３相交流電圧が供給されるように単相逆変換回路が制御されるため、３相負荷装置の１相の電位を接地電位とし、他の相の電圧の瞬時値を、最大で３相交流電源の線間電圧の約√２倍程度の電位に抑制することができる。その結果、漏洩電流および電源ノイズを抑制することができる。また一般的な単相順変換回路および一般的な単相逆変換回路を用いることができるため、インバータ装置の小型化、構成部品点数の削減および低コスト化が可能となる。さらに構成部品点数の削減に伴い、損失も低減できる。

【００７５】つぎの発明によれば、単相高力率順変換回路が、単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなり、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に接続され、単相逆変換回路が３相負荷装置の残りの２相入力に接続され、３相制御手段により、３相負荷装置に３相交流電圧が供給されるように単相逆変換回路が制御され、さらに高力率順変換制御手段により、３相交流電源から流入する電流が概略正弦波化されて力率が改善されるように単相高力率順変換回路が制御されるため、３相交流電源から流入する電流を概略正弦波化し、力率を改善することができる。

【００７６】つぎの発明によれば、単相順変換回路が３相交流電源の３相出力のうちの２相に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の残りの１相出力に接続されると共に、３相負荷装置の３相入力のうちの１相に開閉手段を介して接続され、３相逆変換回路が３相負荷装置の３相入力に接続され、開閉回路制御手段により開閉手段が、３相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態となり、また３相逆変換回路の出力を電源電圧のほぼ２倍までの３相電圧とする場合に開路状態となるように制御され、さらに３相制御手段により、開閉手段の開閉状態に対応して３相負荷装置に３相交流電圧が供給されるように３相逆変換回路が制御されるため、３相逆変換回路からの出力を、電源電圧とほぼ同電圧までの３相電圧と、電源電圧のほぼ２倍までの３相電圧とに切り替えることができる。

【００７７】つぎの発明によれば、３相順変換回路が３相交流電源の３相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相交流電源の１相出力に開閉手段を介して接続されると共に、３相負荷装置の３相入力のうちの１相に接続され、単相逆変換回路が３相負荷装置の残りの２相入力に接続され、開閉回路制御手段により開閉手段が、単相逆変換回路の出力を電源電圧とほぼ同電圧までの３相電圧とする場合に閉路状態となり、また単相逆変換回路の出力を電源電圧のほぼ２分の１倍までの３相電圧とする場合に開路状態となるように制御され、さらに３相制御手段により、開閉手段の開閉状態に対応して３相負荷装置に３相交流電圧が供給されるように単相逆変換回路が制御されるため、単相逆変換回路からの出力を、電源電圧とほぼ同電圧までの３相電圧と、電源電圧のほぼ２分の１倍までの３相電圧とに切り替えることができる。そして、単相逆変換回路の出力が電源電圧のほぼ２分の１倍までの場合には、スイッチングによる電圧変化がほぼ２分の１倍となるので、漏洩電流および電源ノイズ抑制に対しより大きな効果が得られるのに加えて、出力電圧に対するキャリア周波数成分の割合が抑制され、電流のリプル成分や、負荷の不安定状態を抑制することができる。

【００７８】つぎの発明によれば、３相順変換回路が３相交流電源の３相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、３相負荷装置の３相入力のうちの１相に第１の開閉手段を介して接続されると共に、３相交流電源の１相出力に第２の開閉手段を介して接続され、３相逆変換回路が３相負荷装置の３相入力に接続され、開閉回路制御手段により、３相逆変換回路の出力電圧範囲に対応して第１の開閉手段および第２の開閉手段のそれぞれの開閉状態が制御され、さらに３相制御手段により、第１の開閉手段および第２の開閉手段の開閉状態に対応して３相負荷装置に３相交流電圧が供給されるように３相逆変換回路が制御されるため、３相逆変換回路からの出力を、電源電圧のほぼ２分の１倍までの３相電圧と、電源電圧とほぼ同電圧までの３相電圧と、電源電圧のほぼ２倍までの３相電圧とに切り替えることができる。

【００７９】つぎの発明によれば、３相順変換回路が３相交流電源の３相出力に接続され、平滑回路のコンデン

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サどうしの中間接続部の一つが３相交流電源の中性点に接続され、３相逆変換回路が３相負荷装置の３相入力に接続されるため、３相逆変換回路の出力を増大することができ、さらには３相負荷装置に印加される接地電位に対する瞬時電圧も抑制できるので、漏洩電流および電源ノイズを抑制することができる。

【００８０】つぎの発明によれば、平滑回路のコンデンサどうしの中間接続部は３相負荷装置の中性点にも接続されるため、３相負荷装置の中性点電位が安定し、漏洩電流および電源ノイズをより一層抑制することができる。

【図面の簡単な説明】

【図１】　本発明の実施の形態１にかかる３相インバータ装置の構成を示すブロック図である。

【図２】　本発明の実施の形態２にかかる３相インバータ装置の構成を示すブロック図である。

【図３】　本発明の実施の形態３にかかる３相インバータ装置の構成を示すブロック図である。

【図４】　実施の形態３のインバータ装置の動作を説明するためのフローチャートである。

【図５】　本発明の実施の形態４にかかる３相インバータ装置の構成を示すブロック図である。

【図６】　実施の形態４のインバータ装置の動作を説明するためのフローチャートである。

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＊【図７】　本発明の実施の形態５にかかる３相インバータ装置の構成を示すブロック図である。

【図８】　実施の形態５のインバータ装置の動作を説明するためのフローチャートである。

【図９】　本発明の実施の形態６にかかる３相インバータ装置の構成を示すブロック図である。

【図１０】　本発明の実施の形態７にかかる３相インバータ装置の構成を示すブロック図である。

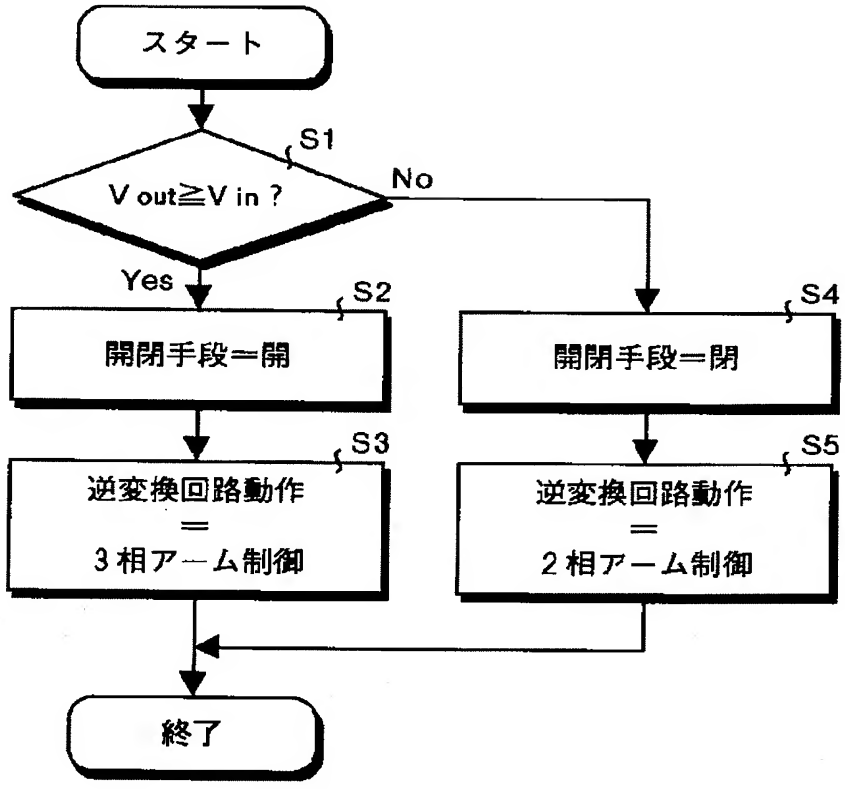
【図１１】　一般的な３相インバータ装置の構成を示すブロック図である。

【図１２】　漏洩電流および電源ノイズを低減するための対策を施した従来の単相インバータ回路の構成を示すブロッ図である。

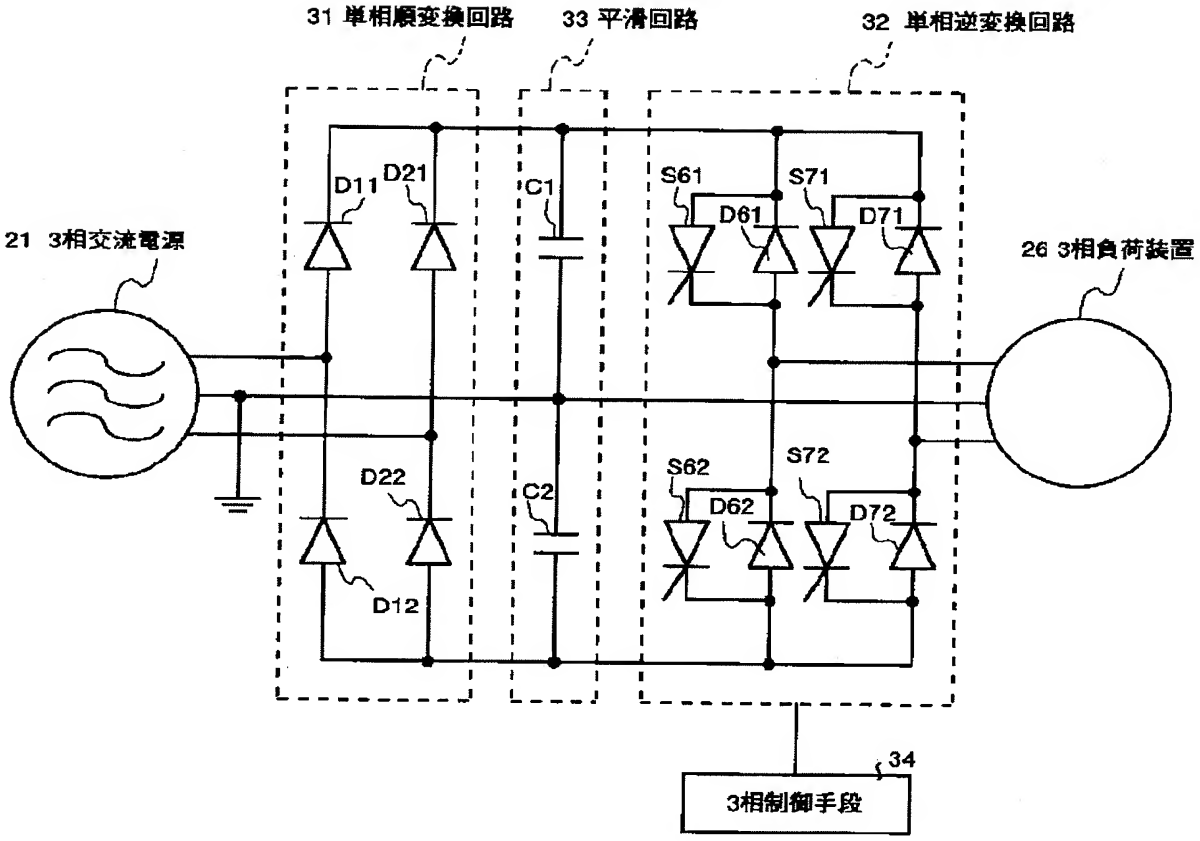
【符号の説明】

Ｃ１，Ｃ２　コンデンサ、Ｄ１１１，Ｄ１１２，Ｄ１２１，Ｄ１２２　単相フルブリッジ整流器、Ｓ１１１，Ｓ１１２，Ｓ１２１，Ｓ１２２　スイッチ素子、２１，２３　３相交流電源、２６，２８　３相負荷装置、３１　単相順変換回路、３２　単相逆変換回路、３３　平滑回路、３４，５６　３相制御手段、４１単相高力率順変換回路、４２，４３　リアクトル、４４　高力率順変換制御手段、５２　３相逆変換回路、５４，６４　開閉手段、５５，６５　開閉回路制御手段、６１　３相順変換回路。

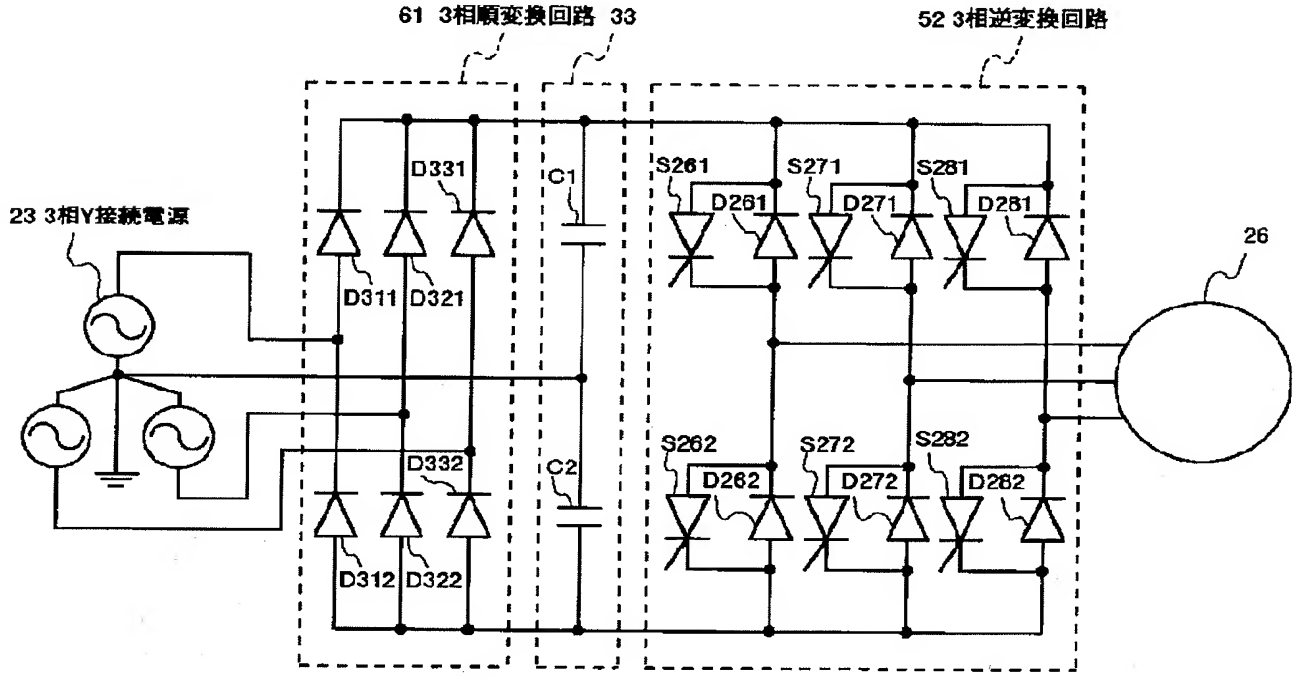
【図４】



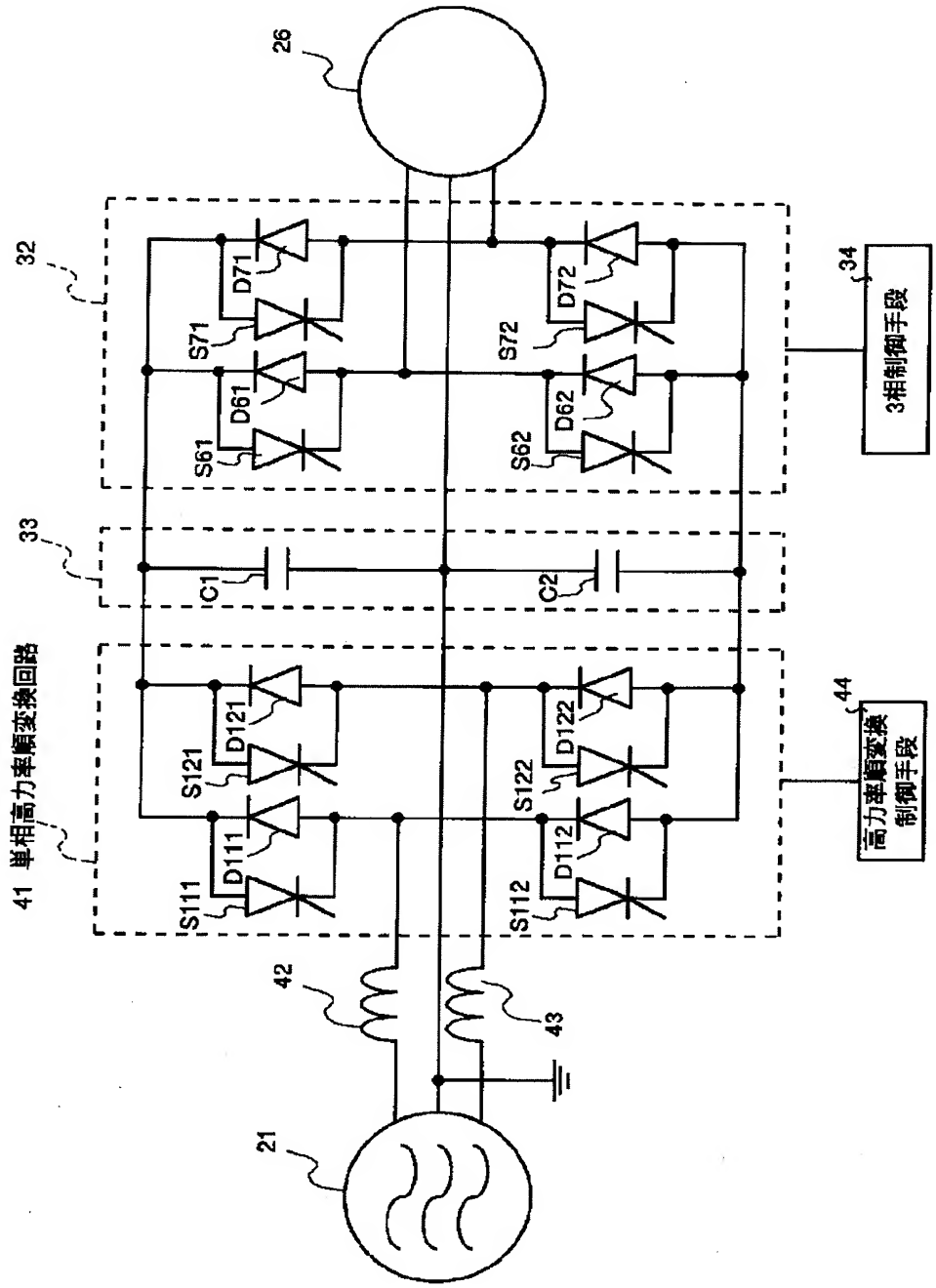
【図１】


31 単相順変換回路
33 平滑回路
32 単相逆変換回路
21 3相交流電源
26 3相負荷装置
D11
D21
C1
S61
S71
D61
D71
D22
C2
S62
S72
D62
D72
D12
34
3相制御手段

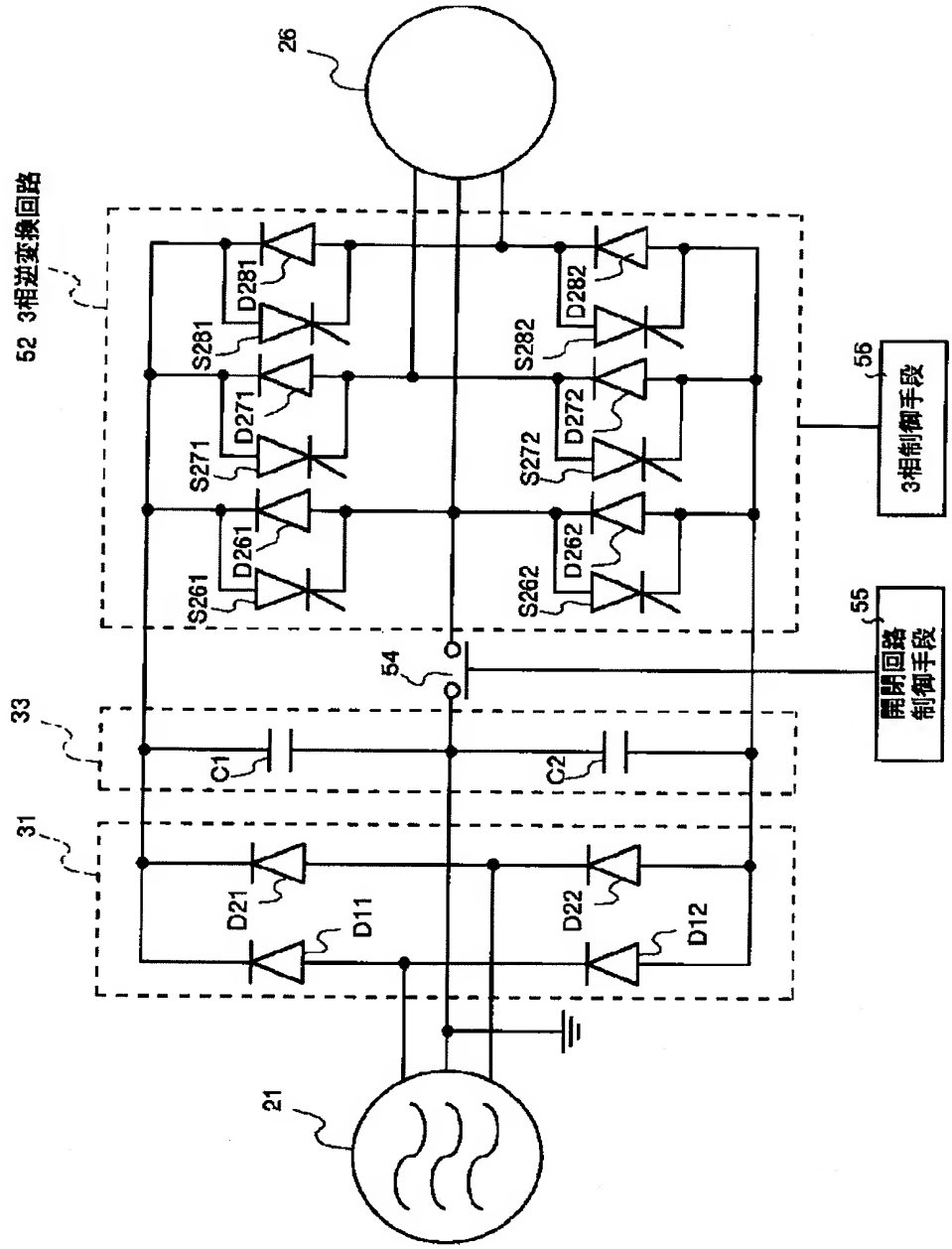
【図９】


61 3相順変換回路
33
52 3相逆変換回路
23 3相Y接続電源
26
D331
C1
S261
S271
S281
D261
D271
D281
D311
D321
D332
C2
S262
S272
S282
D262
D272
D282
D312
D322

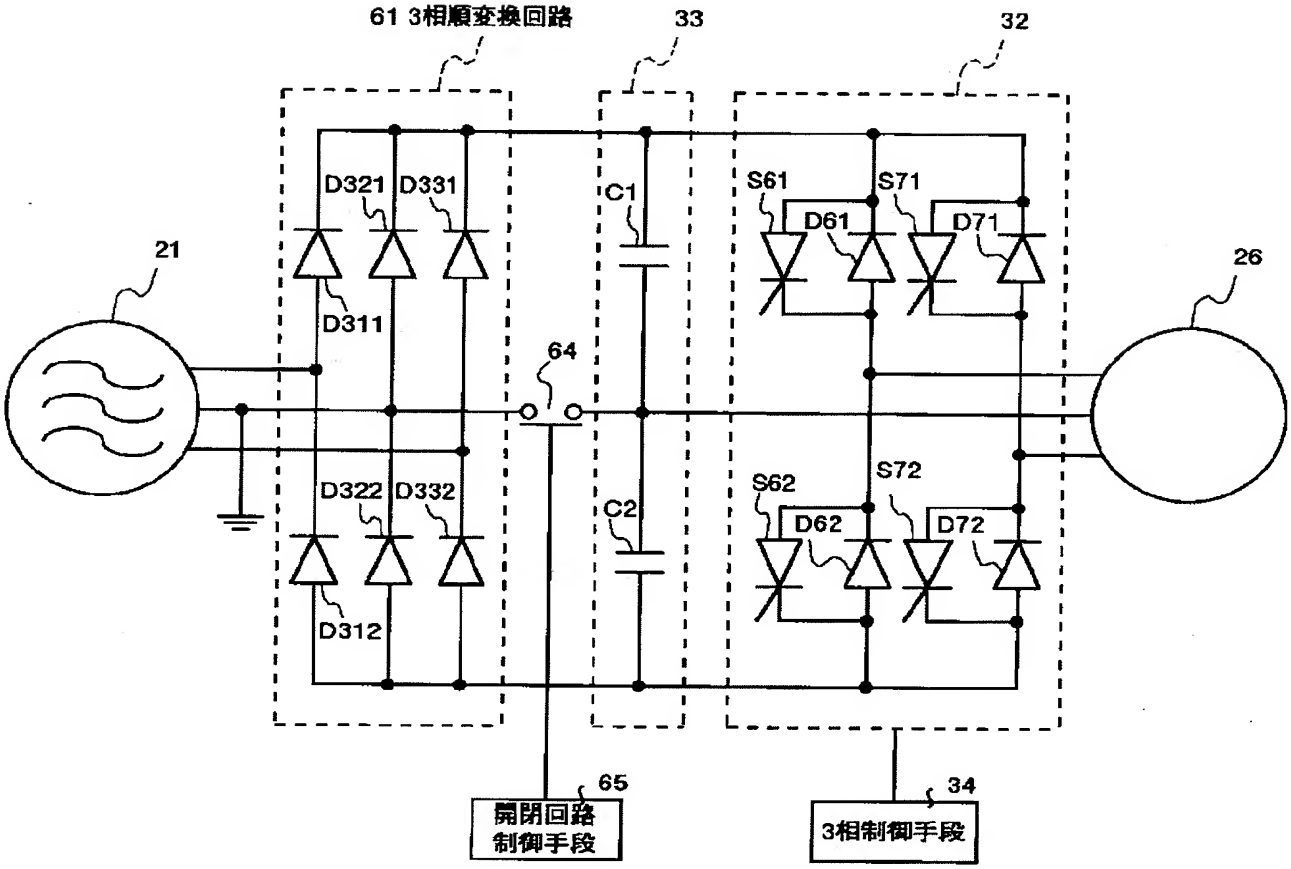
【図２】


26
32
D71
S71
D61
S61
D72
S72
D62
S62
34
3相制御手段
33
C1
C2
41 単相高力率順変換回路
D121
S121
D111
S111
D122
S122
D112
S112
44
高力率順変換制御手段
42
43
21

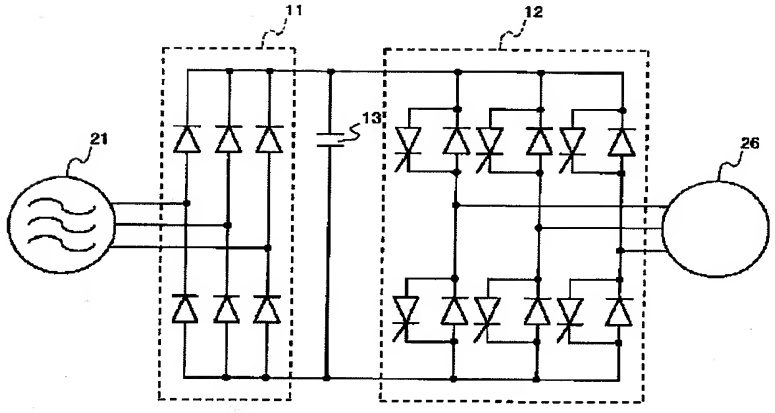
【図３】


26
52 3相逆変換回路
S281
D281
S282
D282
S271
D271
S272
D272
S261
D261
S262
D262
56
3相制御手段
55
開閉回路制御手段
54
33
C1
C2
31
D21
D11
D22
D12
21

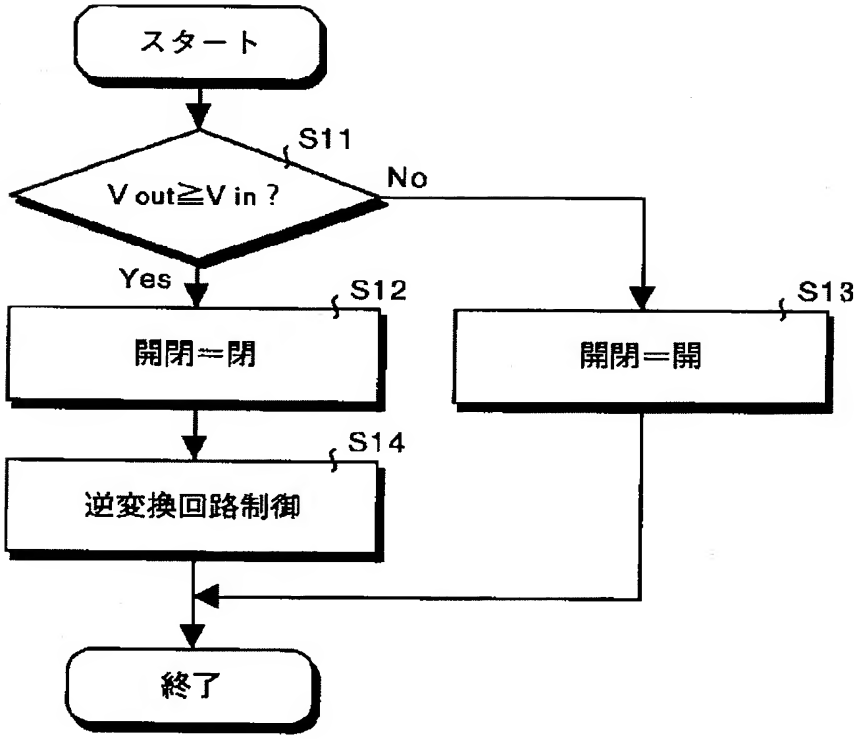
【図５】


61 3相順変換回路
33
32
D321
D331
C1
S61
S71
D61
D71
21
26
D311
64
D322
D332
C2
S62
S72
D62
D72
D312
65
開閉回路
制御手段
34
3相制御手段

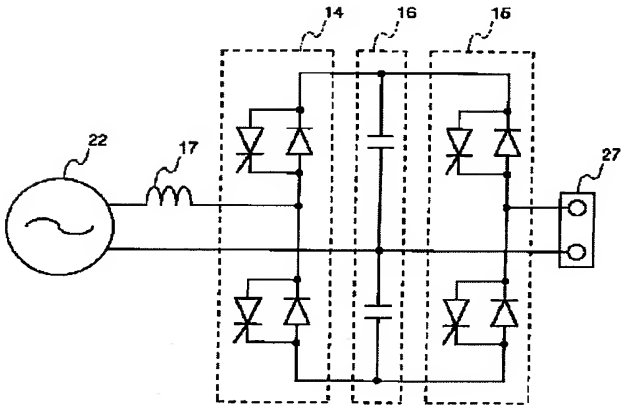
【図１１】


11
12
13
21
26

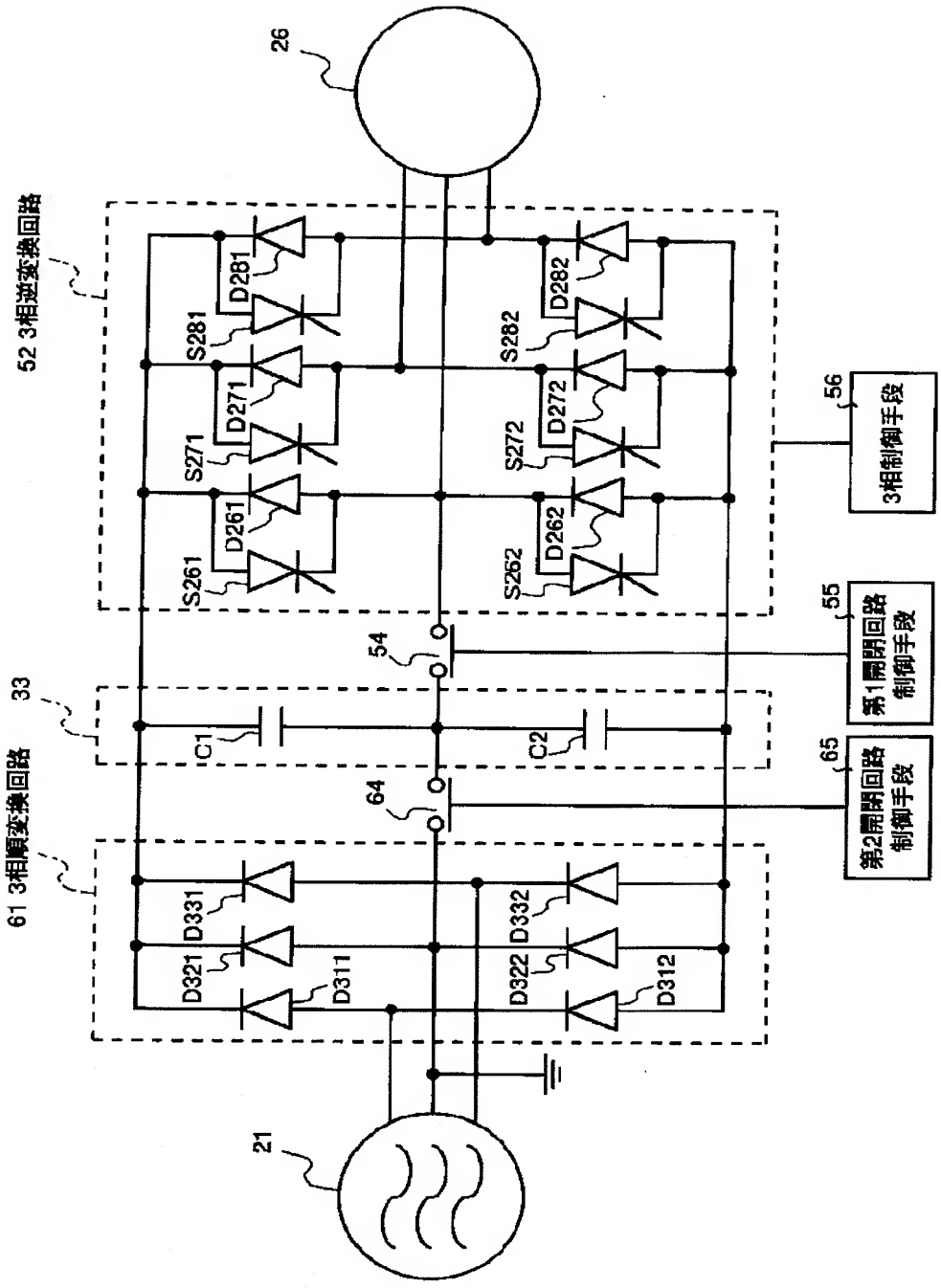
【図６】


スタート
S11
Vout≧Vin？
No
Yes
S12
開閉＝閉
S13
開閉＝開
S14
逆変換回路制御
終了

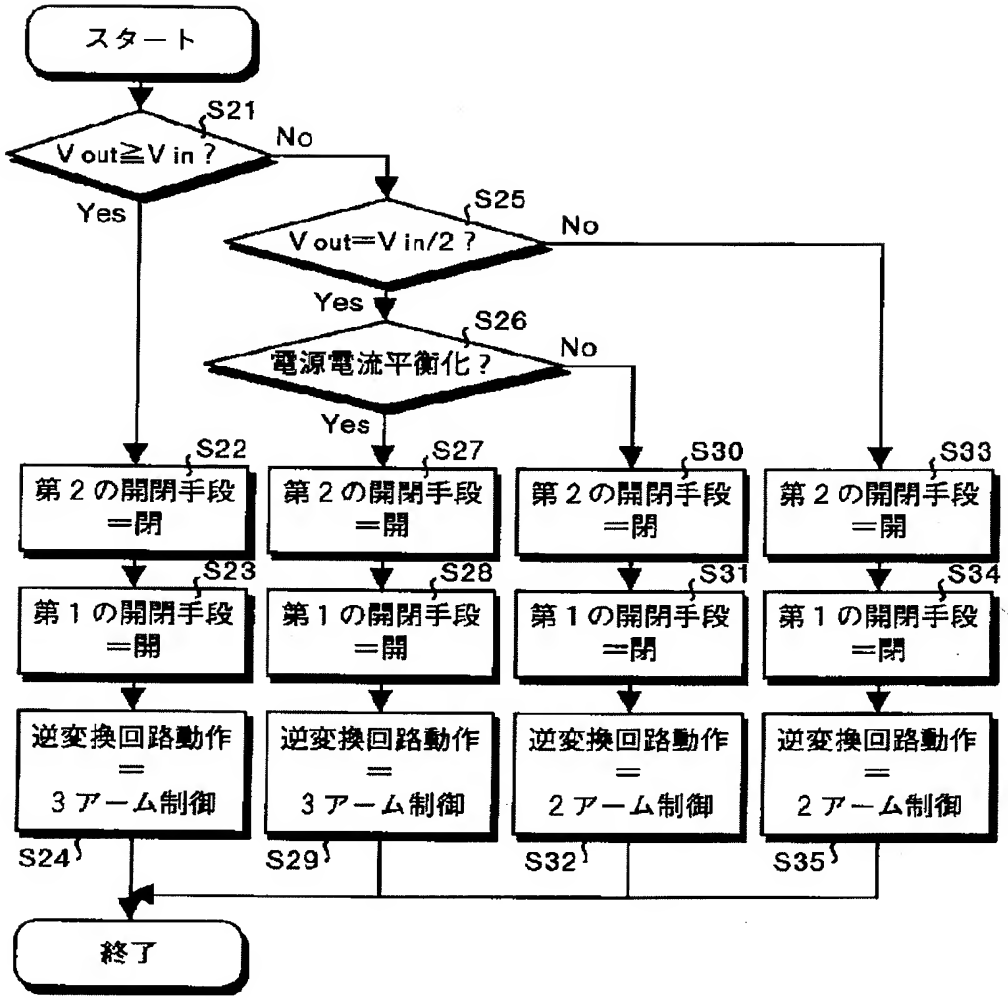
【図１２】


14
16
15
22
17
27

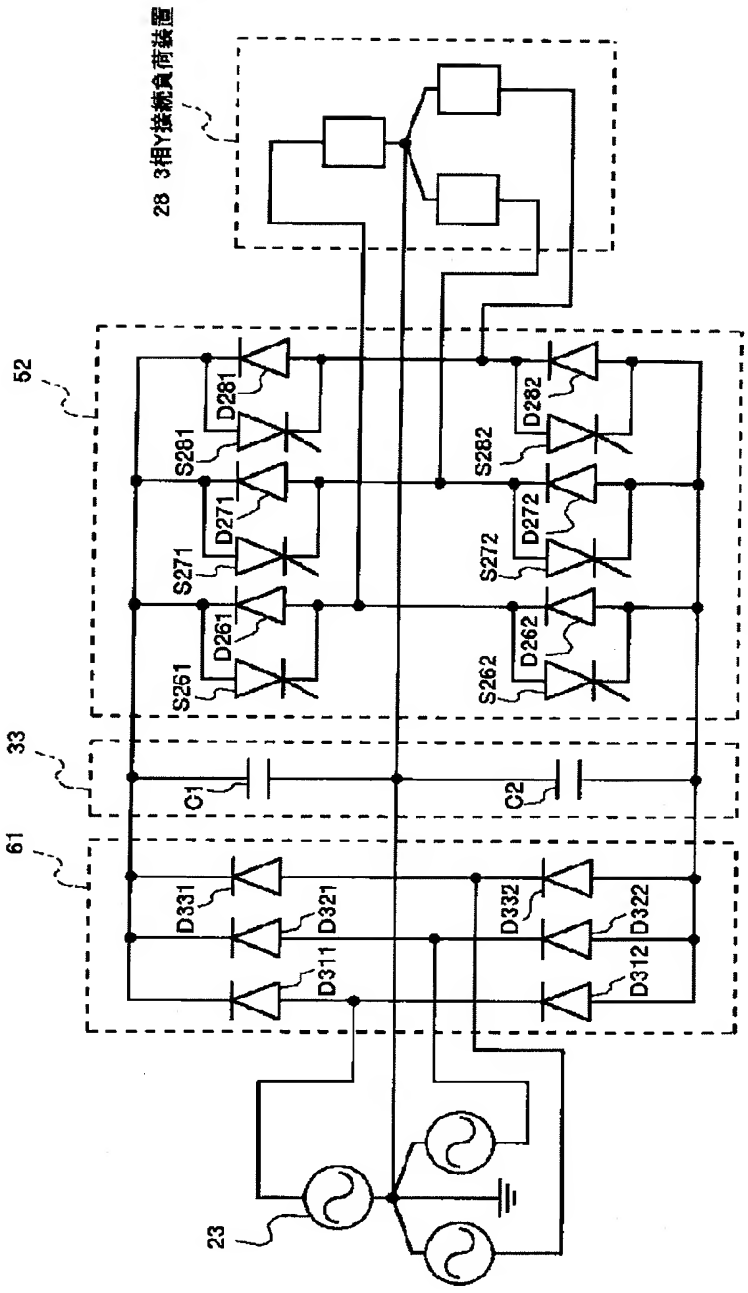
【図７】


26
52 3相逆変換回路
S281
D281
S282
D282
S271
D271
S272
D272
S261
D261
S262
D262
56
3相制御手段
54
55
第1開閉回路
制御手段
33
C1
C2
64
65
第2開閉回路
制御手段
61 3相順変換回路
D331
D332
D321
D311
D322
D312
21

【図８】


スタート
S21
Vout≧Vin？
No
Yes
S25
Vout=Vin/2？
No
Yes
S26
電源電流平衡化？
No
Yes
S22
第２の開閉手段＝閉
S27
第２の開閉手段＝開
S30
第２の開閉手段＝閉
S33
第２の開閉手段＝開
S23
第１の開閉手段＝開
S28
第１の開閉手段＝開
S31
第１の開閉手段＝閉
S34
第１の開閉手段＝閉
逆変換回路動作＝３アーム制御
逆変換回路動作＝３アーム制御
逆変換回路動作＝２アーム制御
逆変換回路動作＝２アーム制御
S24
S29
S32
S35
終了

【図１０】


28 3相Y接続負荷装置
52
D281
S281
D271
S271
D261
S261
D282
S282
D272
S272
D262
S262
33
C1
C2
61
D331
D321
D311
D332
D322
D312
23